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LAING (E. V.). **Elaphomyces sp. (false truffle) and tree roots.**—*Scottish Forestry Journ.*, xlvii, 1, pp. 14–18, 3 figs., 1933.

The writer has frequently observed the fructifications of species of *Elaphomyces* in Scotland in close pine and spruce stands, and also at times in association with larch, *Thuja plicata*, and beech roots. The fungus is widely distributed and the writer considers it to be the most common of all mycorrhizal fungi [cf. *R.A.M.*, xii, p. 183]. It is found under close canopy where there is little or no vegetation, but fructifications have not been seen where the canopy is open and herbaceous plants cover the soil.

LA RUE (C. D.). **Intumescences on leaves of Eucalyptus cornuta, E. coccifera, Hieracium venosum, Mitchella repens, and Thurberia thespesioides.**—*Phytopath.*, xxiii, 3, pp. 281–289, 2 figs., 1933.

An account is given of the writer's observations in Michigan on the occurrence of intumescences of unknown causation on leaves of *Eucalyptus cornuta, E. coccifera, Hieracium venosum, Mitchella repens*, and *Thurberia thespesioides*. With the exception of those on the last-named host, all the intumescences under discussion may be described as 'mixed', since they combine the characters of hypertrophies and hyperplasias, being formed by the swelling and division of the epidermal and mesophyll cells or of only the latter. In *T. thespesioides* the outgrowths may show a few cell divisions, but they are mainly produced by the swelling of the regular mesophyll layers. Periderm formation occurred in all the outgrowths except those on *M. repens*. In *E. coccifera* the intumescences contain anthocyanin and thus appear as red spots on the foliage.

GREENE (H. C.). **Variation in single spore cultures of Aspergillus fischeri.**—*Mycologia*, xxv, 2, pp. 117–138, 4 figs., 1 diag., 1933.

The writer obtained 448 monospore cultures from a stock culture of *Aspergillus fischeri* [*R.A.M.*, xii, p. 384], a perithecial form. Some of these monospore cultures showed striking morphological variations [full details of which are given] as compared with the parent culture. The variants fell into two main types: (1) characterized by very large, scattered perithecia in place of the small, closely and uniformly distributed bodies of the stock culture; and (2) marked by a profusion of conidia and scanty perithecial development, the contrary of the stock culture.

In one culture of type (1), successive subcultures, both from ascospores and conidia, reproduced the characters of the variant parent through several single spore generations. In another, however, single ascospore derivatives yielded cultures of practically identical morphology with the original stock for a number of generations, whereas conidial cultures reproduced the variant type. Monospore cultures from a type (2) variant reproduced the variant characters, whether ascospores or conidia were used.

NANNFELDT (J. A.). **Heterotalli och hybridisering hos rostsvampar. Litteraturöversikt.** [Heterothallism and hybridization in rust fungi. A review of the literature.]—*Svensk Bot. Tidskr.*, xxvii, 1, pp. 104–107, 1933.

A concise summary is given of some important contemporary studies in connexion with the problem of heterothallism and hybridization among the rusts. The papers under discussion have been fully noticed in this *Review*.

SANFORD (G. B.) & MARRITT (J. W.). **The toxicity of formaldehyde and mercuric chloride solutions on various sizes of sclerotia of Rhizoctonia solani.**—*Phytopath.*, xxiii, 3, pp. 271–280, 1 graph, 1933.

The writers tested at Edmonton, Alberta, various time-strength combinations of cold formaldehyde and standard and acidulated mercuric chloride on small (1·5 by 0·2 to 0·4 mm.), medium (2·5 by 0·5 to 0·7 mm.), and large (3·5 by 0·8 to 1·5 mm.) sclerotia of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xii, p. 391].

The [tabulated] results of the experiments showed that after two hours' immersion in cold formaldehyde (1 in 240), 2 per cent. small, 19 per cent. medium, and 56 per cent. large sclerotia were still viable. A period of 480 minutes was necessary to kill all the large sclerotia. At a strength of 1 in 120 the lethal periods for the small, medium, and large sclerotia were 90, 180, and 270 minutes, respectively. The cold mercuric chloride solution (1 in 834) was more effective than any of the formaldehyde solutions used, destroying the small, medium, and large sclerotia in about 60, 130, and 150 minutes, respectively. The acidulated mercuric chloride solution (1 in 500 plus 1 per cent. by volume of hydrochloric acid) killed all the small sclerotia in 3, and the medium in 5 minutes, but 8 per cent. of the large ones were still viable after 5, and 2 per cent. after 13 minutes.

Both the acidulated and standard mercuric chloride solutions were found to be effective against the small and medium sclerotia up to the fifth successive immersion, and probably up to the eighth, for practical purposes, by lengthening the time in the solution.

Under the conditions of the trials (one season) the vitality of the potato sets was not reduced appreciably by cold formaldehyde, 1 in 120 up to 240 minutes; or 1 in 240 up to 470 minutes; cold mercuric chloride, 1 in 834 up to 120 minutes; and acidulated mercuric chloride, 1 in 500 up to 8 minutes.

From counts made on nine representative lots of potatoes the ratios of small, medium, and large sclerotia was 13 : 3 : 1.

ANDERSON (A. K.), EVERITT (E. L.), & ADAMS (P. D.). **The carbon metabolism of Fusarium oxysporum on glucose.**—*Journ. Agric. Res.*, xlvi, 5, pp. 473–482, 1 graph, 1933.

The results of the experiments described in this paper indicated that the main products of the metabolism of *Fusarium oxysporum* in a glucose-containing medium are carbon dioxide and ethyl alcohol, in a proportion which suggests that, like *F. lini* [*R.A.M.*, v, p. 441; vii, p. 592], this fungus causes a somewhat typical alcoholic fermentation. There was evidence, however, that while *F. lini* very definitely uses ethyl alcohol as a source of food [ibid., vii, p. 593], *F. oxysporum* makes only slight use of this product.

When cut potato shoots were placed in ethyl alcohol solutions up to a concentration of 5 per cent., they exhibited no symptoms of wilting, and developed a very striking odour resembling that of ripe cantaloupes, this suggesting, in the authors' opinion, that small quantities of alcohol are rendered non-toxic by conversion into an ester by the potato plant. Definite wilt symptoms were only shown when the cut shoots were placed in solutions of 10 per cent. and over, though it is thought quite possible that the actual concentration of the alcohol in the tissues was much below 10 per cent. While, therefore, there is no experimental evidence to support the theory that alcohol is responsible for the wilting of potato plants infected by *F. oxysporum*, there may be reasons to suppose that it is at least a factor in the production of the wilt symptoms.

FRIEBE (P.). **Zur elektrometrischen Messung des 'Abbaugrades' der Pflanzkartoffel. Eine praktische Erfahrung mit dem neuen Verfahren von Dr. Hay und Dr. Wartenberg.** [On the electrometric measurement of the 'degree of degeneration' of the seed Potato. A practical test by the new method of Dr. Hey and Dr. Wartenberg.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, ix, 9, pp. 351–355, 1 diag., 1933.

Making use of the method devised by Drs. Hey and Wartenberg at the Biological Institute, Berlin, for the determination of the ratio between oxidation and reduction processes in the resting potato tuber, the writer carried out a series of tests on Erstling [Duke of York] potatoes of known sound and 'degenerated' origin. The results of field observations completely confirmed the laboratory data, which showed that the electric tension between the elements of the apparatus ranges from 0 to −180 millivolts for healthy tubers and from −180 to −200 for those inclining to degeneration; below −200 degeneration in the progeny is practically a certainty. The applicability of the method on a large scale is briefly discussed, the cost of testing 30 tubers from a wagonload worth M. 1,000 being estimated at M. 15.

STEPHAN (J.). **Die Melaninbildung in der Kartoffel. Ein kritisches Referat.** [Melanin formation in the Potato. A critical review.]—*Pflanzenbau, Pflanzenschutz u. Pflanzenzucht*, ix, 9, pp. 356–365, 1 fig., 1933.

The writer summarizes the literature on melanin formation in potato tubers and discusses the conclusions regarding this phenomenon reached by different workers [*R.A.M.*, viii, p. 598]. There

is no basis for the view that the black discoloration developing on cooking is a sign of degeneration; it is, on the contrary, associated with active metabolism, especially as regards albumin production. In tubers affected by degeneration diseases the albumin metabolism is at a low ebb and discolorations do not develop. The possible application of the electrometric method for the determination of the oxidation-reduction potentials [see preceding abstract] to melanin formation is briefly discussed.

ITO (S.). **Primary outbreak of the important diseases of the Rice-plant and common treatment for their control.**—*Hokkaido Agric. Exper. Stat. Rept.* 28, 211 pp., 7 pl. (1 col.), 7 graphs, 1932. [Received May, 1933. Japanese, with English summary.]

The most important and widespread diseases of rice in Japan are stated to be blast (*Piricularia oryzae*), sesame leaf spot (*Ophiobolus miyabeanus*), and 'bakanae' (*Gibberella fujikuroi*) [*R.A.M.*, xi, pp. 398, 536–538, 800].

The hyphae of *P. oryzae* may be readily detected within the tissues of the straw and seeds harvested from diseased plants. The name 'paddy blast' commonly refers to the grains which become completely empty with dark greyish spots on the surface of the hull. On closer observation some grains appearing superficially sound are found to show a greyish discoloration of the scale-like glumes and rachids adhering to them after threshing, and for this phase of the disease the name 'glume blast' is proposed. Under dry conditions most of the conidia from the diseased straw and seeds remained viable for a year or more, while the mycelium survived for as long as $3\frac{3}{4}$ years. The conidia were killed when frozen in water but they withstood 45 days at 4° C., while some of the intracellular hyphae remained viable for the same period in a frozen condition. The overwintered conidia were clearly shown to be pathogenic to rice leaves. Seedlings from seeds with 'glume blast' symptoms nearly always died at an early stage and were covered with conidia of *P. oryzae*.

Numerous conidia (*Helminthosporium oryzae*) and hyphae of *O. miyabeanus* occur on and in the straw and seeds collected in diseased fields. Affected seeds may be entirely covered with a blackish growth but in relatively mild cases the hull often shows only rust-coloured spots, a symptom readily overlooked so that diseased seeds are frequently sown with healthy ones. Indoors the conidia and hyphae of *O. miyabeanus* survived for about two and over three years, respectively, while some of the hyphae persisted through the winter on dry ground but not in farmyard manure. The ascigerous stage of the fungus developed in culture, but continuous search for it in the fields has yielded uniformly negative results. Inoculation tests with overwintered conidia produced the typical leaf spot lesions on rice leaves, while blighted seedlings developed from 'rust paddy' seeds.

The principal results of the author's studies on the bakanae disease have already been noticed from a previous report [loc. cit.], but the following point is of interest. Seedlings arising from seeds smeared with the conidia (*Fusarium*) of the 'red paddy'

(so called from the salmon-coloured sporodochia along the suture line of the glumes) developed severe symptoms of bakanae, which also appeared in a much milder form on plants infected through the soil.

In addition to these three serious diseases, over 70 species of fungi have been recorded on rice straw in Japan. The pathogenicity of the following has been proved by inoculation experiments: *Alternaria oryzae* Hara, *Helicoma echinosporium* Ito et Sasaki n. sp., *Phyllosticta* sp., and *Epicoccum neglectum* [ibid., xi, p. 183]. *H. echinosporium* is characterized [according to the Latin diagnosis] by sterile, filiform, branched, hyaline to olivaceous, septate hyphae 2·4 to 7·2 μ in width; fertile, erect, simple, 0- to 5-septate, pale, later fuliginous or olivaceous hyphae, 24 to 120 by 3·6 to 4·8 μ; and acro-pleurogenous conidia in groups of 3 to 6, cylindrical or long-ellipsoid, tapering and rounded at both ends, with uni- to biconvolute spirals near the apex, 1- to 14-septate, constricted at the septa, echinulate, olivaceous, and measuring 16·8 to 117·6 by 7·2 to 18 μ (mean 75·05 $\pm$ 0·708 by 11·34 $\pm$ 0·089).

Certain fungi [unspecified in the English summary] penetrate the tissues and finally attack the kernels, resulting in the so-called 'spoiled rice'.

The conidial death points of *P. oryzae*, *O. miyabeanus*, and *G. fujikuroi* subjected to various disinfectant treatments were as follows: copper sulphate, 2 per cent. for *P. oryzae*, undetermined for the other two; mercuric chloride, 0·05, 0·1, and 0·1 per cent., respectively; formaldehyde, 0·175, 0·25, and 0·7 per cent.; hot water (5 minutes), 52°, 54°, and 57° to 60°; hot water (10 minutes), 51°, 53° to 54°, and 54° to 55°. The corresponding figures for the internal hyphae were as follows: copper sulphate, 4 per cent. 48 hours for *P. oryzae*, ineffective against *O. miyabeanus*, and 1 per cent. 24 hours for *G. fujikuroi*; mercuric chloride, 0·1 per cent. 6 hours for *P. oryzae* and *O. miyabeanus*, ineffective against *G. fujikuroi*; formaldehyde, 0·7 per cent. 3 hours for *P. oryzae* and *O. miyabeanus*, 0·7 per cent. 1 hour for *G. fujikuroi*; hot water 55° 5 minutes for *P. oryzae*, ineffective against the other two. It is apparent from these results that copper sulphate is the least satisfactory of the treatments and formalin the most efficacious, mercuric chloride is moderately toxic but not to be generally recommended, while hot water is applicable only to blast. Great stress is laid on the necessity of excluding diseased straw from the rice fields.

NORMAN (A. G.). **The biological decomposition of plant materials. Part VIII. The availability of the nitrogen of fungal tissues.** —*Ann. of Appl. Biol.*, xx, 1, pp. 146–164, 2 graphs, 1933.

Continuing his studies on the biological decomposition of plant materials [*R.A.M.*, xii, p. 393], the author describes in some detail experiments in which he claims to have established that fungal tissue, as represented by killed mycelial pads of *Aspergillus versicolor*, *A. fumigatus*, *A. terreus*, *A. niger*, and mixed fungal and bacterial tissue, is as suitable a source of nitrogen to soil-inhabiting micro-organisms (mixed soil flora and pure cultures of certain

fungi) for the decomposition of straw as ammonium salts and nitrates. The work also comprised the determination of the amount of ammonia liberated from fungal tissue added to sand by pure cultures of reputedly active ammonifiers, and a comparison of its nitrification in soils with that of artificial mixtures of equal C/N ratio built up from glucose, cellulose, and straw, each with added inorganic nitrogen. A very clear correlation was found between the C/N ratio of the fungal material and the nitrogen nitrified, the nitrification increasing markedly as the C/N ratio decreased. There was no evidence to show the existence of a very resistant and unnitrifiable residue from the fungal tissue, incomplete nitrification being probably attributable to the attainment of biological equilibrium or of a state in which change is very slow.

BISBY (G. R.), JAMES (N.), & TIMONIN (M.). **Fungi isolated from Manitoba soil by the plate method.**—*Canadian Journ. of Res.*, viii, 3, pp. 253–275, 2 figs., 1933.

Using the technique outlined by W. B. Brierley and his collaborators and by S. A. Waksman [*R.A.M.*, viii, p. 126; xi, p. 470], the writers isolated 121 species of fungi belonging to 44 genera, together with about 20 fungi not yet identified, from 75 samples of various types of Manitoba soil. Critical and taxonomic notes are given on the species already determined.

The soils supporting plant life gave counts of fungi ranging from 18,000 to 350,000 per gm., the highest numbers being obtained from forest soils, though a lucerne field yielded 240,000 moulds in January and 195,000 in June. An immediate and consistent increase in the fungus population of a wheat plot followed the application of ammonium phosphate at sowing time at the rate of 45 lb. per acre. The long, cold winter of Manitoba does not appear to reduce the number of viable spores in the soil [cf. ibid., xii, p. 140].

Several parasitic fungi were isolated in the course of these experiments, including *Fusarium culmorum*, a prevalent agent of root rot in cereals [ibid., xii, p. 502], and *Helminthosporium sativum*, the latter represented by seven out of 7,000 colonies developing from 40 wheat plot isolations. The average number of fungi found in the wheat field was 90,000 per gm. of surface soil, so that each gram of a soil cropped to wheat for some time in Manitoba may contain 90 viable spores or mycelial fragments of *H. sativum* [ibid., xi, p. 169].

The results of culture experiments showed that *Trichoderma lignorum* is capable of completely overwhelming and destroying the colonies of *F. culmorum* and *H. sativum*, and it is suggested that the former organism may play an important part in reducing the activities of certain soil pathogens under natural conditions [cf. ibid., xii, p. 192].

NIETHAMMER (ANNELIESE). **Studien über die Pilzflora böhmischer Böden.** [Studies on the fungus flora of Bohemian soils.]—*Arch. für Mikrobiol.*, iv, 1, pp. 72–98, 3 figs., 1933.

From various types of soil (meadow, garden, arable, forest, etc.), in Czecho-Slovakia the writer isolated, among other organisms,

five species of *Fusarium* (including *F. discolor*, *F. solani*, and *F. oxysporum*), nine Mucoraceae, three species of *Penicillium*, *Aspergillus repens*, *Trichoderma koningi*, *T. lignorum*, and one species each of *Cephalosporium*, *Zygodesmus*, *Torula*, and *Dimerosporium* [cf. *R.A.M.*, xii, p. 191].

Many of the fungi grew well in culture on samples of the soils from which they were taken, indicating the probable presence in the natural substratum, not only of the spores but also of the mycelium. In certain cases where seeds and fungi were grown together in pure culture, both parties appeared to benefit from the association (e.g., *Mucor racemosus* with *Festuca pratensis* and *Poa pratensis*, peas with *T. lignorum*), a fact that may bear on the mycorrhiza problem [cf. ibid., xii, p. 309]. Uspulun-universal (0·00001 per cent.) increased the stimulatory effect in the joint cultures of *M. racemosus* and *P. pratensis*.

F. solani and *F. oxysporum*, *T. koningi* and *T. lignorum*, and *Penicillium glaucum* made good growth on sulphite cellulose.

MERKENSCHLAGER (F.). **Über das Brom in der Pflanzenpathologie.** [On bromine in phytopathology.]—*Pharmazeut. Zeit.*, lxxviii, 12, p. 162, 1 fig., 1933.

A survey is given of current observations by the writer and others of the action of bromine compounds, chiefly eosin, on seed germination and growth. The effects of this compound (the potassium salt of tetrabromofluorescein) take the form of disturbances in geotropism, and are already apparent at a dilution of 1 in 640,000. When seeds, e.g., of maize or lupin, are placed in eosin (1 in 100,000) and left over-night the roots grow upwards. Bromural exerts a definitely pathological action on barley roots, the caps of which are sloughed off.

LINDQUIST (J. C.). **Sobre la presencia de la 'Phytophthora capsici' en la Republica Argentina.** [On the presence of *Phytophthora capsici* in the Argentine Republic.]—*Physis*, xi, pp. 170–174, 1932.

A note is given on the occurrence in the chilli [*Capsicum annuum*] plantations of La Plata, Argentine Republic, of the fruit rot due to *Phytophthora capsici* [*R.A.M.*, xii, p. 496], which in 1932 caused a loss of 80 per cent. of the crop. The symptoms of the disease and the life-history of the causal organism, which was readily isolated and grown in artificial culture, are briefly described.

GHOSH (M. N.). **Yellowing of Sugarcane in the district of Saran in North Bihar.**—*Current Science*, i, 6, p. 162, 1932.

Co. 213 sugar-cane at the Government Farm, Sepaya, has been observed since 1925 to develop an extensive yellowing of the foliage between the months of July and September during breaks in the monsoon after heavy showers of rain. The symptoms appear suddenly on the tip of the fourth or fifth leaf and travel rapidly downwards. The old roots are found to have decayed and

no new ones are formed. The disturbance occurs on light soils and on those with a hydrogen-ion concentration of P_H 9 or above. The affected leaves show an abnormally large accumulation of carbohydrates with a correspondingly low nitrogen content. Good results have been obtained by the application of nitrogenous and phosphatic fertilizers and by earthing up, the plants forming new roots, turning green, and resuming fresh growth. The disease would thus appear to be due to a deficiency of available nitrogen in the soil at a time when it is in heavy demand by the growing plants.

NEGODI (G.). **Su di alcuni Deuteromiceti nuovi.** [On some new Deuteromycetes.]—*Atti Soc. Nat. Modena*, lxiii, (Ser. VI, xi), pp. 40–45, 8 figs., 1932.

Taxonomic notes, accompanied by Latin diagnoses, are given of three new species of fungi from Somaliland, namely, *Gloeosporium somalense* on *Sansevieria robusta*, *Plenodomus nigricans* on *S. stuckii*, and *Phoma encephalarti* on *Encephalartos horridus*, of which only the first is considered to be a parasite.

The infected plants of *S. robusta* showed a wilting of the foliage, which was further characterized by an olive-black, concentric spotting of the subepidermal tissues (the lesions being subcircular or elliptical, 1 to 4 mm. in diameter) and in the later stages by longitudinal fissures. The disease assumed a very severe form and finally killed the plants. The oblong-cylindrical, continuous, hyaline conidia tapering at the base and measuring 21 to 27 by 3·5 to 5 μ, are borne at the subhyaline apices of rod-shaped, fuliginous conidiophores arising from dark, oblong acervuli immediately below the epidermis of the host.

TRANZSCHEL (W. A.). О принадлежности ецидиев на Барбарисе к **Puccinia pygmaea Erikss.** [On the relationship of aecidia on Barberry to *Puccinia pygmaea* Erikss.]—*Comptes rendus Acad. des Sciences URSS, 1931*, pp. 45–48, [? 1931. German, with Russian summary.]

The purpose of this brief note is to draw the attention of phytopathologists to the occurrence on barberry (*Berberis vulgaris*) in the region of Leningrad and in the Russian Far East of the aecidial stage of *Puccinia pygmaea*, which macroscopically closely resembles that of *P. graminis* and may easily be confused with the latter. Microscopically the aecidia of *P. pygmaea* are indistinguishable from those of *P. arrhenatheri* [*R.A.M.*, x, p. 601], and both differ from those of *P. graminis* in that their spores are not thickened at the apex and have coarsely warted peridial cells, while those of *P. graminis* are covered with fine warts. The genetic relationship of the aecidia on barberry to *P. pygmaea* was conclusively demonstrated by the author's artificial inoculations of this host with teleutospores of the latter fungus collected in 1929 and 1930 from species of *Calamagrostis* in the neighbourhood of Leningrad. It is pointed out that, unlike *P. arrhenatheri*, *P. pygmaea* does not produce witches' brooms on barberry.

VIENNOT-BOURGIN (G.). **Notes sur quelques Urédinales et Ustilaginales observées en 1931–1932 dans le département de Seine-et-Oise (région Sud).** [Notes on some Uredinales and Ustilaginales observed in 1931–1932 in the Department of Seine-et-Oise (south region).]—*Rev. Path. Vég. et Ent. Agric.*, xx, 2, pp. 85–114, 1933.

A catalogue is given of 109 rusts and 18 smuts found in the Seine-et-Oise Department in 1931–2, with notes on the biology of the fungi, the influence of climatic conditions on their development, and the relations between the aecidial form and the uredospore or teleutospore stage of heteroecious rusts. The stage of development of the host when the fungus appeared is indicated in each case.

GOIDÀNICH (G.). **Miceti Bolognesi. Contributo alla conoscenza della flora micologica della Provincia di Bologna. VI. Centuria.** [Bolognese fungi. A contribution to the knowledge of the mycological flora of the Province of Bologna. Sixth century.]—Reprinted from *Malpighia*, xxxii, 26 pp., 2 figs., 1932.

This list of fungi found in the province of Bologna now brings the number of species recorded for this locality up to six hundred. It includes, among others, the following records. *Sclerospora macrospora* was found on the leaves of *Triticum* and *Phragmites* during the spring, 1929–31, in wheat plots on mud flats near the river Samoggia, where the plants were liable to the flooding necessary for the development of the fungus [*R.A.M.*, x, p. 174]. In 1924–6, *Urophlyctis leproides* (Trabut) P. Magn. was observed on beet leaves. *Cephalosporium acremonium* forma *major* Penzig was found parasitizing *Penicillium crustaceum*, the parasitic behaviour being identical with that described by Penzig for attack on *Alternaria tenuis*.

STOREY (H. H.) & LEACH (R.). **A sulphur-deficiency disease of the Tea bush.**—*Ann. of Appl. Biol.*, xx, 1, pp. 23–56, 4 pl. (1 col.), 1933.

This is a full report of the authors' investigation of the tea yellows disease in Nyasaland, a preliminary account of which has already been noticed [*R.A.M.*, xi, p. 805]. The whole syndrome of the disease is that of a gradual degeneration ending in the death of individual shoots and branches, and finally of the whole tea bush. In the early stages there is little or no stunting of the leaves and internodes, but the leaves develop a yellow mottling, the network of veins remaining green. At a later stage the leaves and internodes become markedly stunted, and the mottling of the leaves gives way to a general severe chlorosis; the leaves tend to be somewhat uprolled and to develop brittleness, and frequently their tissue dies from the tip or edge, shrivelling to a dark brown colour. These symptoms become more accentuated as the disease advances; in extreme cases mature leaves are reduced to a length of not over 1·5 cm., the shoot being thin and weak with closely crowded nodes. All the leaves formed after the onset of the disease, except the

youngest, are shed, and lateral buds develop prematurely, producing stunted shoots with minute, yellow leaves. Eventually the terminal bud is killed and a gradual die-back of the shoot sets in. The final state is a leafless bush bearing many dead or dying thin shoots, although occasionally living axillary shoots may be found near the base. In young diseased plants the root system may be poorly developed, but in an old bush with an extensive root system no effect was observed upon the structure of the roots after the onset of the yellows disease. Severely diseased tea plants were shown usually to contain little or no starch reserve in their roots. From the histological standpoint, the small yellow leaves of an affected shoot appear to have been arrested in their development while still immature; their palisade layer is poorly differentiated, the mesophyll cells are crowded and more uniformly arranged, and the intercellular spaces are much reduced; the cell walls are thinner, and the stomata of the lower surface are more numerous in diseased than in healthy leaves. In the early stages of the disease the plastids are reduced in size and number, and apparently disappear entirely in severely diseased leaves.

The remainder of the paper is given to a detailed description of the experiments [the results of which have already been noticed from the earlier publication] which established that the cause of the disease is to be attributed to a soil deficiency in sulphur, and also to an account of control measures by means of applications of adequate fertilizers. The part played by *Rhizoctonia bataticola* [*Macrophomina phaseoli*] in the etiology of the disease was further studied, and it was concluded that this fungus is not concerned in the initiation of the trouble.

North Florida Experiment Station.—*Ann. Rept. Florida Agric. Exper. Stat. for the fiscal year ending June 30, 1932*, pp. 149–156, 2 figs., 1932. [Received June, 1933.]

L. O. Gratz states that downy mildew or blue mould of tobacco (*Peronospora hyoscyami*) appeared almost simultaneously on all the seed-beds of the various sections of Gadsden and Madison during the week of 22nd February, and was still rampant on some late-sown beds on 10th May [*R.A.M.*, xii, p. 402].

JENSEN (J. H.). **Leaf enations resulting from Tobacco mosaic infection in certain species of Nicotiana L.**—*Contrib. Boyce Thompson Inst.*, v, 1, pp. 129–142, 7 figs., 1933.

The leafy outgrowths or enations reported by Iwanowski and Dickson [cf. *R.A.M.*, i, p. 392] on mosaic tobacco and recently observed by Holmes on the leaves of *Nicotiana tomentosa* and *N. paniculata* affected with tobacco mosaic virus [ibid., xii, p. 119] were produced experimentally by the author on the two last-named hosts. They arise from the lower surface of the leaf as small, inverted, cup-shaped or double leaf-like protusions and surround (either wholly or, very occasionally, partly) some of the chlorotic areas in the leaf, which, usually more or less parallel to the larger veins, sometimes seem to be unrelated to the position of any vein. Enations form only on leaves developing after systemic infection has occurred. Similar outgrowths have been observed at

times, associated with tobacco mosaic infection, in *N. tabacum* var. *angustifolia*.

The enations begin as small paired ridges on the under side of a young leaf, and are due to an increase in the number of cell layers resulting from cell division in the lower three or four layers of tissue. The two protuberances are sometimes so close together that they are more or less merged; occasionally both appear to arise from the same point in the leaf, with the result that only one protuberance is seen. In the early stages all the cells are meristematic. Further development progresses by cell division in the small ridges of tissue. Cell division both in the malformation and the remainder of the leaf ceases when the leaf is three-quarters to one inch long.

The cells in the outgrowth quickly form seven distinct layers and begin differentiation with those of the corresponding layers of the rest of the leaf. In both, the palisade layer becomes differentiated first, this being followed by the appearance of conducting elements and spongy parenchyma. The area of the main leaf between the two wings of an enation usually at first resembles the rest of the leaf in cross-section, but sometimes cell development in this area becomes arrested, with the result that the leaf is thinner here than elsewhere; as the outgrowth develops, this area becomes chlorotic and remains thin. In a fully expanded leaf these chlorotic areas consist of undifferentiated cells containing small quantities of cytoplasm, very little chlorophyll, and poorly developed plastids.

On a fully grown leaf the two inner and the two outer sides of an enation always show an identical arrangement of the cell layers. Palisade parenchyma is present in the subepidermal cell layer of the two inner sides and often spreads across the lower side of the space between, forming a complete layer of palisade cells inside the enation. In other cases, the palisade development is restricted to the inner sides of the outgrowths. When palisade development is present at the bottom of a cup-shaped enation it is absent from the upper side of the leaf above this area. Palisade formation in the outgrowth occasionally precedes that in the main portion of the leaf.

Tissue similar to that usually found on the lower side of leaves is differentiated in the outer sides of the outgrowth. The cells of the second to the fifth layers from the outside develop into spongy parenchyma with large intercellular spaces, so that in cross-section a portion of a large outgrowth resembles a portion of the main leaf, containing seven layers of cells similar in size, shape, and arrangement to those of the rest of the leaf.

The production of enations on *N. paniculata* inoculated with tobacco mosaic may be prevented by partial shading.

JOHNSON (J.). **Cucumber mosaic on Tobacco in Wisconsin.**—*Phytopath.*, xxiii, 3, p. 311, 1933.

In 1932 the examination of samples from 60 tobacco plants, representing 25 fields in various parts of Wisconsin, revealed the presence of the typical cucumber mosaic virus [*R.A.M.*, xii, p. 108] in 26, of ordinary tobacco mosaic in 21, and of unidentified viruses, apparently distinct from either of these, in 13. In a field

at Madison, some 30 per cent. of the tobacco plants were affected by cucumber mosaic and a high percentage by tobacco mosaic, and the former disease is believed to have been still more prevalent in other parts of the State. More limited observations and experiments indicated a similar situation in respect of mosaic on tomato [cf. ibid., xii, p. 333]. The occurrence of cucumber mosaic in an epidemic form on tobacco appears, on the basis of past field records, to be unusual.

Fracanzani (G. A.). **Mosaicatura del Tabacco.** [Tobacco mosaic.]—*Boll. Tecn. R. Ist. Sperim. Colt. Tabacchi 'Leonardo Angeloni'*, Scafati (Salerno), xxix, 4 (XI, 1932), pp. 244–247, 1933.

In this paper (reprinted from the *Giorn. Agric. Domenica*, 1st January, 1933), the writer briefly discusses the factors involved in the development of tobacco mosaic, which is stated to have devastated the valuable plantations of Salerno, Italy, in 1932 [cf. *R.A.M.*, vi, p. 395], and describes his preliminary experiments in the control of the disease by the injection of ferrous sulphate into the stems. The best results were given by four injections (each of 1 c.c.) of the compound at a strength of 3 per mille. The treated plants are stated to have lost all trace of mosaic, resumed vigorous growth, and given an abundant yield. Good control of the disease was also given by the same substance at 8 per mille, but the plants made poor growth, while the application of 5 or 10 per cent. solutions of ferrous sulphate to the soil by means of irrigation was ineffectual. The untreated plants suffered severely from mosaic.

Smith (J. H.). **Streak in Tomatoes aseptically grown.**—*Ann. of Appl. Biol.*, xx, 1, pp. 117–122, 1933.

This is a brief report of the author's work [a reference to which has already been noticed from another source: *R.A.M.*, xii, p. 140], the results of which showed that when tomato plants were grown from sterile seeds under strictly aseptic conditions, it was possible by inoculation of bacteriologically sterile juice from infected plants to produce in them symptoms of tomato streak [ibid., xii, p. 250], a disease which is usually associated in nature with bacteria, without the development in them of the accompanying bacterial organisms. There was no evidence that the bacteria ordinarily found in naturally infected plants are derived from the virus, or the virus from these organisms.

The association of *Bacillus lathyri* with tomato streak or stripe [ibid., iii, p. 197] is, therefore, not necessarily an indication that it causes the disease.

Berkeley (G. H.) & Madden (G. O.). **The transmission of streak and mosaic diseases of Tomato through seed. No. II.**—*Scient. Agric.*, xiii, 7, pp. 455–457, 1933. [French summary on p. 472.]

Continuing their studies on the transmissibility of the tomato streak and mosaic diseases [*R.A.M.*, xii, p. 250], the authors describe further experiments, the results of which showed that the mosaic is extensively transmitted through the seed, and that

the infective principle may be present in seeds from green as well as from ripe tomatoes produced by affected plants. It was found, however, that the seed from certain trusses of a mosaic plant may produce progeny exhibiting symptoms of mosaic, while seed from other trusses on the same plant may produce healthy plants under similar environmental conditions, a phenomenon which is not yet understood. From a practical standpoint, these experiments again emphasize the necessity for growers of greenhouse tomatoes of maintaining their own seed supply by means of a rigid selection from healthy plants, and of isolating their crops from sources of infection, since the mosaic produced by artificial inoculations with the crushed embryos of seed from mosaic plants was shown to be contagious and apparently similar in all respects to the ordinary tomato mosaic.

SMITH (K. M.). **Spotted wilt: an important virus disease of the Tomato.**—*Journ. Min. Agric.*, xxxix, 12, pp. 1097–1103, 3 pl. (1 col.), 1933.

This is a brief, popular account of the author's investigation up to date of the spotted wilt of tomato, which is now stated to be widely spread in England [*R.A.M.*, xii, p. 59]. Most of the information contained in it has already been noticed.

VAN POETEREN (N.). **Comité inzake bestudeering en bestrijding van de Iepenziekte. Jaarverslag over 1932.** [Committee for the study and control of the Elm disease. Annual Report for 1932.]—*Tijdschr. over Plantenziekten*, xxxix, 3, pp. 73–76, 1933.

The writer, in his capacity as secretary to the committee for the study and control of the elm disease (*Ceratostomella ulmi*) in Holland [*R.A.M.*, xii, p. 478], briefly reports on its activities during 1932. These included scientific papers and reports, a widespread publicity campaign through the press, exhibitions, lectures, and an investigation of the possibilities of control.

CORNELI (E.). **Moria degli Olmi prodotta da 'Graphium ulmi' Schwarz.** [Die-back of Elms produced by *Graphium ulmi* Schwarz.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 27–31, 2 pl., 1933.

Die-back of elms (*Graphium* [*Ceratostomella*] *ulmi*) [*R.A.M.*, xii, p. 404] was first observed in Umbria in 1930, the attack being severe and the spread of infection extremely rapid.

Cultures from diseased material grown on barked elm twigs or in elm leaf decoction agar after a few days showed the presence of dark synnemata, usually in clusters of three or more arising from a common point of origin but spreading out; each averaged 300 to 400 by 25 to 30 μ and had a terminal cap measuring up to 120 μ in diameter; the non-septate, hyaline, round or slightly elongated spores averaged 2·5 to 3 by 2 to 3 μ.

In carrot decoction and meat broth agar synnemata did not develop, but multiple budding of single spores occurred, producing a whitish, mucous layer at the edge of which a hyaline, septate, creeping mycelium developed, giving rise to short, unbranched, creeping or erect conidiophores bearing hyaline, non-septate conidia

measuring up to 8 by 3·5 μ, some of which also budded. The mycelial layer tended to grow in concentric circles. This form may be referred to the form-genus *Cephalosporium* [cf. ibid., x, p. 632].

On elm extract agar there was no initial budding but a vigorous development of frequently sterile mycelium with the subsequent formation of tufts of dark coremia arising from a dense mycelial weft.

Inoculations of healthy, wounded elm twigs gave positive results with all these types of spore (*Graphium, Cephalosporium*, and the budding form).

In a few instances the prompt, complete excision of affected branches gave satisfactory results.

TINI (G.). **Prove di germinazione di spore di 'Oidium quercinum'.** [Germination tests of the spores of *Oidium quercinum*.]—*Riv. Pat. Veg.*, xxiii, 1–2, pp. 45–45, 1933.

After referring to the serious damage still caused to *Quercus* [*robur* var.] *sessiliflora* in the vicinity of Assisi by *Oidium quercinum* [*Microsphaera quercina*: *R.A.M.*, x, p. 278; xi, pp. 682, 767], the author states that repeated attempts [by methods which are described] to germinate the ascospores were unsuccessful, and they are thought to play no part in the overwintering of the fungus in Italy.

Experiments showed that the optimum temperature for the germination of the conidia in hanging drop cultures was about 18° to 20° C., at which temperatures germination was complete in 12 hours; at 25° it was halved, at 28° scarcely perceptible, and at 30° it ceased. When the conidia in hanging drop cultures were exposed to 0° for 24 hours and then removed to a temperature of 16° to 18°, they germinated normally; similar exposure to −3° gave about 50 per cent. germination, to −5° gave very little, and to −10° none. When leaves bearing conidia, however, were exposed for 24 hours to −10° and then removed to a normal temperature for germination, about 50 per cent. germination resulted, similar exposure to −7° giving about 60 per cent. germination, to −5° giving almost complete, and to higher temperatures complete germination.

It is concluded that in Italy *M. quercina* may overwinter on the host in the conidial stage.

HAAS (A. R. C.). **Walnut yellows in relation to ash composition, manganese, iron, and other ash constituents.**—*Bot. Gaz.*, xciv, 3, pp. 495–511, 2 figs., 1933.

A fully tabulated account is given of the writer's comparative analyses of certain ash constituents in a large number of samples of healthy walnut bark and leaves and those affected by yellows in California [*R.A.M.*, viii, p. 207]. The ash content of the diseased bark was higher than that of the healthy, and the former generally showed more magnesium, manganese, and inorganic phosphate than the latter. The magnesium, inorganic phosphate, manganese, and iron contents were higher in diseased than in healthy foliage, and manganese was also not deficient in the few rosetted pecan

leaf samples examined at the same time. Walnut yellows cannot, therefore, be attributed to manganese deficiency [ibid., xi, p. 326 *et passim*] unless a considerable amount of this substance is unavailable.

Mielke (J. L.). **Tuberculina maxima in western North America.** *Phytopath.*, xxiii, 3, pp. 299–305, 1933.

Tuberculina maxima, a parasite of several pine rusts in North America, has now been found on white pine blister rust (*Cronartium ribicola*) on *Pinus monticola* [ibid., xii, p. 407] and on *C. comptoniae* on *P. contorta* [ibid., xi, p. 616]. On *C. ribicola* it occurs in British Columbia and Washington, while on *C. comptoniae* it has been found only in British Columbia. The parasite is not considered to be an important factor in the control of white pine blister rust.

Baxter (D. V.). **Some resupinate Polypores from the region of the Great Lakes. IV.**—*Papers Michigan Acad. Science, Arts and Letters*, xvii, pp. 421–439, 10 pl., 1933.

Continuing his key to the resupinate Polypores of the Great Lakes region of the United States [*R.A.M.*, xi, p. 552], the writer gives critical and taxonomic notes on the brown species studied on conifers and hardwoods during the last few years. The genera chiefly represented are *Poria*, *Fomes*, *Polyporus*, and *Trametes*. Even such a common and well-known species as *F. igniarius* presents a complicated problem on appearance in a resupinate form, and similar difficulties are encountered in the study of *F. igniarius* var. *nigricans*, *Poria betulina*, and others. Preliminary cultural studies of several of these brown types indicate that the characteristic growth forms developing under these conditions may be used to supplement the usual microscopic features in the work of identification. Marked differences in mycelial growth [shown in a table] were observed between *F. igniarius* var. *nigricans*, *P. betulina*, *P. prunicola*, and *P. punctata*.

Robak (H.). **On the growth of three wood-destroying Polyporeae in relation to the hydrogen-ion concentration of the substratum.**—*Svensk Bot. Tidskr.*, xxvii, 1, pp. 56–76, 4 graphs, 1933.

At the University of Oslo, Norway, *Polyporus* [*Polystictus*] *zonatus* [*R.A.M.*, vii, pp. 205, 689], *Polyporus fuliginosus* (*P. benzoinus*), and *P.* [*Fomes*] *annosus* were cultured on sterilized pine (*Pinus sylvestris*) sawdust adjusted to different hydrogen-ion concentrations by the addition of hydrochloric acid or sodium carbonate. The growth range for *Polystictus zonatus* was found to extend from P_H 4·5 to between 6·3 and 6·5, that for *F. annosus* from 4·0 to 6·3, and that for *Polyporus benzoinus* from 4·0 to nearly 6·0. The optimum concentration for the growth of *Polystictus zonatus* appears to be about P_H 5·5, a figure agreeing with the values often found in the wood of deciduous trees such as birch (*Betula alba*) and alder (*Alnus incana*). The corresponding point for *Polyporus benzoinus* lies between P_H 4·5 and 5·0, a frequent reaction in *Picea excelsa* and *Pinus sylvestris* according to

H. Gløımme (*Meddel. Norske Skogforsøksvesen*, iii, 1, 1928), and for *F. annosus* between 5·3 and 5·8. In the case of the last-named fungus the soil reaction appears to be more important than that of the wood. *Polystictus zonatus* intensified the acidity of the medium, whereas *F. annosus* increased alkalinity.

CAMPBELL (A. H.). **Zone lines in plant tissues. I. The black lines formed by Xylaria polymorpha (Pers.) Grev. in hardwoods.**—*Ann. of Appl. Biol.*, xx, 1, pp. 123–145, 3 pl., 1933.

From a brief review of the literature dealing with the zone lines formed in timber by wood-decaying fungi [*R.A.M.*, iv, p. 385] the author suggests that they may be classified into three groups: lines due to the antagonism of the mycelia of two fungi, those formed from the mycelium of a single fungus, and those due to the production of 'wound gum'. He gives a detailed account of his investigation of the development of *Xylaria polymorpha* [ibid., vii, p. 645] on artificial media and wood blocks, in the course of which he witnessed the formation by this fungus of black lines in the inoculated wood blocks and in the cotton-wool plugs supporting the blocks at the bottom of the test-tubes. It was found that these lines in reality are the sectional outlines of continuous egg-shaped shells enclosing a matrix of the substratum. The black line itself consists of a dense mass of brown bladder cells of the fungus occupying the lumina of the wood vessels, fibres, and cells of the medullary ray in the path of the line. Apparently the position which the black line is to occupy is at first marked out by the aggregation of thin, hyaline hyphae which later swell up and become closely septate. The bladder cells first make their appearance in rows of isolated patches of irregular shape, then gradually the intervening spaces are filled with the brown hyphae and the line begins to assume a sharply defined appearance. Some of these cells then collapse, and their contents stain the walls of the vessels, penetrate the pits between the cells of the medullary ray, and fill the interstices between the other bladder cells, forming a closely packed barrier almost impenetrable to other invading organisms. It was also found that the black line is always much harder than the surrounding wood, a fact which allowed of dissecting it out as a sheet several inches in area from sufficiently decayed wood. When a portion of the egg-shaped shell represented by the black lines becomes exposed, it gives rise to an effused black mycelium from which develops the stroma or fructification of the fungus, bearing the conidia and the perithecia. As a result of the study, it is suggested that the black lines are the marginal zones of entostromata comparable to those that occur in *Diaporthe*, and it is stated that the black lines produced in the genera *Nummularia*, *Ustulina*, *Hypoxylon*, and *Daldinia* are of similar structure and significance to those of *X. polymorpha*.

An account is also given of a *X. polymorpha* black mycelial line superimposed upon the 'wound gum' zone line formed by the attack of *Fomes applanatus* [*Ganoderma applanatum*] in beech wood, and it is suggested that the confusion existing in the literature on the zone lines of *G. applanatum* is in part attributable to this not uncommon phenomenon.

FRITZ (C[LARA] W.). **Rate of deterioration due to decay in pulpwood storage piles.**—*Pulp and Paper of Canada*, xxxiv, 3, pp. 191, 210, 1933.

The annual loss to the pulp and paper industry of Canada through deterioration of wood in the block pile is computed at a minimum of $5,000,000, and a study of the rate of deterioration in storage piles due to decay was therefore initiated by the Forest Products Research Laboratories [*R.A.M.*, xii, p. 345]. So far, one sample lot of 50 4 ft. sticks (spruce and fir) has been analysed, 25 of 1928 and 25 of 1930 storage. The former were found to contain approximately 1 per cent. more advanced rot than the latter, accompanied by a 0·3 per cent. reduction in pulp yield. The amounts of incipient rot in the 1928 and 1930 piles were 28·80 and 22·79 per cent., respectively, while the incidence of stain [*Ceratostomella* spp.] was 30·45 per cent. in the former as compared with 6·33 per cent. in the latter.

SANBORN (J. R.). **Development and control of microörganisms in pulp and paper mill systems.**—*Journ. of Bact.*, xxv, 1, pp. 70–71, 1933.

This is an abstract of a paper read before the thirty-fourth Annual Meeting of the Society of American Bacteriologists, 28th to 30th December, 1932. The slime-forming organisms in American pulp and paper mills cause discoloration and deterioration of the raw and finished products which result in impaired quality. The predominant slime-forming micro-organisms vary from mill to mill and include bacteria, algae, and moulds. Serious damage, associated with the formation of doughy or rubbery bodies, is caused by fungi of the *Oidium-Monilia* group. Another troublesome type of slime is that induced by *Aspergillus fumigatus* and other cellulose-destroying fungi forming dense, tangled masses of growth. To this group also belong species of *Chaetomium*, *Cladosporium*, *Acrostalagmus*, *Alternaria*, *Trichoderma*, and *Penicillium* [cf. *R.A.M.*, xii, p. 69], which are among the most active agents of pulp deterioration and discoloration. Effective control of microorganisms in paper manufacture may be accomplished by water purification processes, localized chemical treatments, mill sanitation, and special preservative methods.

NEUWIRTH (F.). **Schädlinge und Krankheiten der Rübe im Jahre 1932.** [Pests and diseases of Beet in the year 1932.]—*Zeitschr. für Zuckerind.*, lvii, 27, pp. 209–215, 1 graph, 1933.

A severe outbreak of heart and dry rot of beets [*R.A.M.*, xii, p. 135] was reported from many parts of Czecho-Slovakia as a sequel to the August (1932) heat wave, the most virulent phases of the disease prevailing in the second week of September, though cases were observed as early as July. Similar conditions obtained in respect of scab [loc. cit.]. Nearly all the severe damage occurred in the central and eastern districts, where heavy rains punctuated the dry spell; in southern Moravia and Slovakia, where the drought was uninterrupted, the injuries were relatively slighter. The diseased beets were so unsuitable for sugar manufacture that they were rejected by some of the factories.

Leaf spot (*Cercospora beticola*) was also very prevalent in the eastern districts. A highly virulent bacterial disease caused extensive rotting and interfered with sugar manufacture even more than did the heart and dry rot. Considerable losses were caused by root rot of the germinating stands [*Pythium de Baryanum, Phoma betae*, and *Aphanomyces levis*: ibid., x, p. 425; xi, p. 559]. The following diseases were of minor importance: downy mildew (*Peronospora schachtii*), red rot (*Rhizoctonia violacea*) [*Helicobasidium crocorum*], and rust (*Uromyces betae*) [ibid., xii, p. 317].

WEBER (G. F.). **Some diseases of Cabbage and other Crucifers in Florida.**—*Florida Agric. Exper. Stat. Bull.* 256, 62 pp., 47 figs., 1932.

Popular descriptions are given of the following crucifer diseases in Florida, with notes on control where practicable, the more important disorders being very fully treated: black rot (*Bacterium campestre*) [*Pseudomonas campestris*], watery rot (*Sclerotinia sclerotiorum*), downy mildew (*Peronospora parasitica*), powdery mildew (*Erysiphe polygoni*), rhizoctoniose, damping-off, wire stem, root rot, stem lesions, and bottom rot, all due to *Corticium vagum* (*Rhizoctonia solani*) [*C. solani*: *R.A.M.*, xi, p. 417; xii, p. 133], blackleg (*Phoma lingam*), grey mould (*Botrytis cinerea*), *Alternaria* leaf spots (*A. brassicae* (Berk.) Sacc. and *A. herculea* (E. & M.) Elliott) [*A. circinans* (B. & C.) Bolle and *A. brassicae* (Berk.) Bolle: ibid., iv, p. 61], white rust (*Albugo candida*) [*Cystopus candidus*], anthracnose (*Colletotrichum higginsianum* Sacc.), soft rot (*Bacillus carotovorus*), mosaic, mould (*Rhizopus nigricans*), black root of radish (*Aphanomyces raphani*) [ibid., xii, p. 350], white spot of pe-tsai [*Brassica pekinensis*], radish, and turnip (*Cercosporella albomaculans*) [ibid., vii, p. 213], and leaf spots of radish and *B. pekinensis* (*Cercospora cruciferarum* and *C. bloxami*, respectively), and *C. nasturtii* on watercress (*Radicula nasturtium-aquaticum*) [*Nasturtium officinale*].

HOLMES SMITH (E.). **Celery blight control. (Septoria apii, Bri. & Cav.).**—*Gard. Chron.*, xciii, 2412, pp. 193–194, 3 figs. (1 on p. 185), 1933.

Commenting on the fact that H. H. Stirrup's and J. W. Ewan's bulletin on the control of celery diseases [*R.A.M.*, xi, p. 91] is too little known among the growers of the north-western part of England, the writer states that considerably less than half the samples of local seed inspected during 1931–2 at Manchester University showed an average of under 40 per cent. infection by late blight (*Septoria apii*), while in the majority of the remainder the percentage of disease was well above this figure (up to 83 per cent.). No appreciable reduction of germination followed the immersion of the seed for three hours in a very dilute formaldehyde solution (1 in 300 to 400); in some cases, on the contrary, increases up to 26 per cent. were recorded as a result of treatment, especially in old seed. Excellent growth was made by plants from treated seed sown in frames of which the soil was sterilized with 2 per cent. formaldehyde, and no further fungicidal applications were

found to be necessary. On the other hand, the plants from untreated seed in unsterilized frames made poor growth from the start and were heavily attacked by *S. apii*. Local growers are reluctant to apply copper containing fungicides during the growing period to plants destined for consumption, partly on account of the extra trouble and also because the celery is largely eaten in the raw state. These objections, however, are not raised in cases where the plants are grown for seed, since it is generally recognized that spraying confers additional protection against blight.

The average weight of the plants from treated seed grown in treated soil in the writer's experiments was 4 lb. 14½ oz., compared with 1 lb. 10½ oz. for the untreated, the corresponding market values per dozen being 2*s.* to 2*s.* 6*d.* and 4*d.* to 6*d.* (at the most).

Bryan (Mary K.). **Bacterium cucurbitae on Cucumber.**—*Phytopath.*, xxiii, 3, p. 309, 1 fig., 1933.

Contrary to the writer's previous observations in the United States, H. H. Prasad found infection by bacterial leaf spot (*Bacterium cucurbitae*) on cucumbers in India [*R.A.M.*, x, p. 639]. Subsequently the disease was also found in a mild form on cucumbers by O. C. Boyd in Massachusetts, where it is believed to have spread from heavily infected squash plants. Cross-inoculation experiments between squash and cucumber gave positive results. On the latter host the lesions may be round or somewhat angular, the thin, papery, brown centre having a reddish-brown margin, sometimes surrounded by a yellow halo. There is sufficient similarity between this disease and angular leaf spot [*Bact. lacrymans*] to render field identification difficult.

Porter (D. R.) & Jones (H. A.). **Resistance of some of the cultivated species of Allium to pink root (Phoma terrestris).**—*Phytopath.*, xxiii, 3, pp. 290–298, 1 fig., 1933.

A tabulated account is given of the writers' experiments at Davis, California, to determine the reaction to pink root (*Phoma terrestris*) of 17 onion (*Allium cepa*) varieties and of five other species of *Allium* grown in infested soil.

Most of the onion varieties proved highly susceptible, though some degree of resistance was shown by Sweet Spanish, Valencia, and Prizetaker. Ailsa Craig, Michigan Yellow Globe, Australian Brown, Southport Yellow Globe, Southport Red Globe, Yellow Globe Danvers, Ohio Yellow Globe, and Extra Early Red Flat were among the most susceptible varieties (all over 90 per cent. infection), while a high incidence of pink root (90·1 and 91·4 per cent., respectively) was also recorded on shallots (*A. ascalonicum*) and garlic (*A. sativum*). Extreme resistance characterized the leeks (*A. porrum*), chives (*A. schoenoprasum*), and Nebuka (*A. fistulosum*) used in the tests [*R.A.M.*, xii, p. 416].

Snyder (W. C.). **A new vascular Fusarium disease of Peas.**—*Science*, N.S., lxxvii, 1996, p. 327, 1933.

A disease closely resembling the pea wilt due to *Fusarium orthoceras* var. *pisi* [*R.A.M.*, xii, p. 71] but caused by a distinct species of the same genus has been observed in Wisconsin, Mary-

land, and Delaware, while specimens were also received from New Hampshire, Massachusetts, Idaho, and Montana. Affected plants show a yellowing of the foliage, recurving of the leaflets and stipules, premature stunting, and a bright orange or reddish staining of the vascular elements for some distance up the stem. An important feature of the 'near wilt' disease is its occurrence on varieties known to be immune from *F. orthoceras* var. *pisi*. The causal organism of the new disturbance is characterized in culture by a purple pigmentation and the production of an abundance of spores, including macroconidia, the latter being practically absent from cultures of *F. orthoceras* var. *pisi*.

KOBEL (F.). **Die Aussichten der Immunitätszüchtung bei der Rebe.** [The prospects of breeding for immunity in the Vine.] —*Annuaire Agric. de la Suisse*, xlvii, 2, pp. 248–271, 1933. [French summary.]

The results [which are fully described and tabulated] of studies extending over a considerable period at Wädenswil, Switzerland, on the mode of inheritance of various characters in the vine indicate that, whereas sex, autumnal coloration of the foliage, and colour of the juice follow Mendelian laws, the transmission of resistance to *Peronospora* [*Plasmopara viticola*] and to low temperatures is of a more complex order. It must be assumed, therefore, that the American parents used in the hybridization experiments, *Vitis riparia*, *V. rupestris*, and *V. berlandieri* (which though not completely immune from mildew do not permit the fungus to spore freely on them in the open) are heterozygotic in respect of these characters.

A consideration of the results hitherto obtained in the hybridization trials under discussion does not offer any immediate prospects of successful breeding for immunity, but this character may ultimately be developed by the careful selection of F_1 hybrids between high grade but susceptible *V. vinifera* and the resistant *V. berlandieri* × *V. riparia* types, the crossing of these hybrids either among themselves or with other F_1 stock of proved value, e.g., Oberlin 595, and further selection on the same lines in the F_2 generation. On the basis of the observations hitherto made in this connexion, some six plants in 100,000 may be expected to combine, as the result of judicious selection, the necessary productivity and other desirable qualities with resistance to *P. viticola*.

HUSFELD (B.). **Über die Züchtung plasmoparawiderstandsfähiger Reben.** [On the breeding of Vines resistant to *Plasmopara*.] —*Gartenbauwissensch.*, vii, p. 15, 1932. [Abs. in *Fortschr. der Landw.*, viii, 10, p. 236, 1933.]

This is a discussion of vine breeding on modern genetical lines with the practical object of obtaining resistance to *Plasmopara* [*viticola*]. A method is described of artificial inoculation with the fungus and its maintenance over the winter on the green leaves. By means of mass infections under optimum conditions for the fungus it was possible to test a very large number of vine seedlings for resistance to *P. viticola* [see preceding abstract].

SMALL (T.). **Report of the Mycologist.**—*Rapports aux États de Jersey pour l'année 1932*, pp. 32–61, 1933.

Field tests in Jersey of the disinfection against attack by *Phytophthora infestans* of potato tubers destined for seed [*R.A.M.*, xii, p. 110] with formalin or copper sulphate and caustic soda gave 0·08 and 1·7 per cent., respectively, diseased tubers, as compared with 22·7 and 34·5 per cent. in the controls. In fumigation experiments to control the development of the disease in transit, potatoes dug from a diseased crop were sent to Weymouth and back in a barrel the sides of which had been sprayed with 100 c.c. of 40 per cent. formaldehyde; only 14 per cent. were diseased, as compared with 69 per cent. in another barrel sprayed with water, but the tubers in the formalined barrel were spotted.

Notes are given on the following diseases of tomatoes: *P. infestans*, stem canker due to *Didymella lycopersici* (this disease ranking second in importance to blight on outdoor tomatoes and causing serious damage on crops where *P. infestans* had been checked by spraying), blotchy ripening due to potash and nitrogen deficiency, stripe disease [ibid., xi, p. 494] and leaf mould (*Cladosporium fulvum*) [ibid., xii, p. 194].

Dead potato haulms of Kerr's Pink variety in the field showed the presence of pycnidia closely resembling and perhaps identical with those of *D. lycopersici* [ibid., xi, p. 809].

SĂVULESCU (T.). **L'état phytosanitaire en Roumanie durant l'année 1930–1931.** [Phytosanitary conditions in Rumania during the year 1930–31.]—*Inst. Cerc. Agron. al Romaniei Publ.* 8, 31 pp., 4 figs., 1932. [Rumanian, with French translation. Received July, 1933.]

Continuing his annual reports [*R.A.M.*, xi, p. 156], the author states that in Rumania in 1930–1 wheat suffered but little from attacks of the three rusts *Puccinia triticina* (chiefly biologic form XIII), *P. glumarum*, and *P. graminis* [ibid., xii, p. 426]. Loose smut (*Ustilago tritici*) was fairly widespread, especially on wheat varieties or pure lines resistant to the rusts. In the Danube Valley barley suffered heavily from loose smut (*U. nuda*) and covered smut (*U. hordei*), the first of which in some localities destroyed as much as 50 per cent. of the crop. The most important disease of rye was bunt (*Tilletia secalis*) [ibid., xi, p. 233] which sometimes caused losses of up to 80 per cent.

Sugar beet, especially in the northern provinces, suffered heavily from leaf spot (*Cercospora beticola*) [ibid., xii, p. 349], which reduced the yield by as much as 40 per cent. in some places. In Bukovina some leaf spotting was caused by *Ramularia betae* [ibid., xi, p. 147; xii, p. 135]. Heart rot (*Mycosphaerella tabifica*) [ibid., vii, p. 364] continued to be very prevalent and severe on soils unfavourable for the cultivation of sugar beet, with a reaction of P_H 7·2 to 7·6 and with a calcium carbonate content of 3 to 6 per cent. Anthracnose of chick peas (*Ascochyta rabiei*) [ibid., xii, p. 137], which hitherto had been recorded only in the province of Braila, spread to new areas presumably by means of infected seed.

Sclerotinia fuckeliana [ibid., xi, p. 222] caused very appreciable

rotting of grapes in some regions. In Bukovina the opium poppy [*Papaver somniferum*] was severely attacked and damaged by a leaf spot caused by *Entyloma fuscum* Schroet. The leaf spot on *Yucca filamentosa* caused by *Coniothyrium concentricum* [ibid., xi, p. 22] was observed in several localities, this being believed to be the first record from Rumania. Black canker (*Physalospora cydoniae*) [ibid., xi, p. 656], hitherto known to occur on apples only in Bessarabia and Moldavia, was found to have spread to the rest of the country.

SIEMASZKO (W.). **Quelques observations sur les maladies des plantes en Pologne.** [Some notes on plant diseases in Poland.] —*Rev. Path. Vég. et Ent. Agric.*, xx, 3, pp. 139–147, 1 pl., 1933.

Further notes are given on the more important or rare plant diseases observed by the author in Poland in recent years [cf. *R.A.M.*, x, p. 775], among which the following may be mentioned. It is believed that the chief source of the severe infection of wheat by black rust (*Puccinia graminis*) in 1932 was from uredospores carried by the wind from Hungary and the Balkans [ibid., xii, p. 426]. Buck-wheat [*Fagopyrum esculentum*] is frequently attacked in central Poland by downy mildew (*Peronospora ducometi*) [ibid., viii, p. 422]; *P. fagopyri* recently described by Jaczewski in his monograph of the Phycomycetes [ibid., xi, p. 273] is considered to be identical with the Polish fungus. Hydrangeas in Warsaw are stated to be fairly frequently subject to attacks of *Oidium hortensiae* [ibid., xii, p. 175], and perithecia of the fungus were found in 1930 on this host; contrary to Blumer's views [ibid., vii, p. 447] the perithecia obviously belong to the genus *Microsphaera*; they are globose, black, 110 to 120 μ in diameter, and are supplied with from 10 to 20 hyaline or brownish, rigid, occasionally bifurcated appendages, branched at the apex and measuring 100 to 130 μ in length. Only immature asci and spores were seen. The asci were ellipsoidal or ovoid, 4- to 6-spored, and 38 to 44 by 30 to 36 μ, while the spores were ellipsoidal, hyaline, and 20 to 22 by 8 to 10 μ. The fungus is considered to be new to science, and is named *M. polonica*, a Latin diagnosis being given. *Entyloma dahliae* [ibid., xi, p. 624] was observed for the first time in Poland in 1925 on young *Dahlia variabilis* plants.

Melampsora abieti-caprearum [ibid., v, p. 335] was found on the needles of *Abies alba* in 1930, *Ungulina annosa* [*Fomes annosus*] on *Pinus strobus* and *P. mughus* (a new host for Poland) in 1933, *Rhizina inflata* [*R. undulata*: ibid., ii, p. 431] on *P. sylvestris* in 1929 (previously reported on conifer seedlings in commercial nurseries), and *Dasyscypha calycina* [ibid., xi, p. 141] on a young *P. cembra* tree in 1924. *Hadrotrichum virescens* [ibid., xi, p. 722] is stated to be frequent on *Agrostis alba* in the neighbourhood of Warsaw. *Polygonum auberti* was attacked by a new species of *Ustilago* which is named *U. raciborskiana*, with a Latin diagnosis. The fungus attacks the inflorescences, causing the formation of witches' brooms. Its spores are reticulate and measure 7·5 to 10 μ in diameter.

CONNERS (I. L.). **Twelfth Annual Report of the Canadian Plant Disease Survey 1932.**—*Canada Dept. of Agric., Exper. Farms Branch*, 112 pp., 1933. [Mimeographed.]

Notes are given on the incidence of fungous, bacterial, and non-parasitic diseases on cereals, fodder crops, potatoes and other vegetables, fruit, forest and shade trees, tobacco, and ornamental plants in Canada during 1932 [cf. *R.A.M.*, xi, p. 495]. Several diseases were reported for the first time, the most important being bacterial wilt of maize (*Bacterium* [*Aplanobacter*] *stewarti*) [see below, p. 562], which caused heavy losses in three counties of Ontario and scattered infections in nine others. Another new record was the narcissus blight caused by *Ramularia vallisumbrosae* [ibid., xi, p. 786], which occurred in a destructive form at Cowichan Station, British Columbia, killing the leaves from the tips to the ground, and was also observed in a number of private gardens at Saanichton.

UPPAL (B. N.). **Appendix L. Summary of work done under the Plant Pathologist to Government, Bombay Presidency, Poona, for the year 1931–32.**—*Ann Rept. Dept. of Agric. Bombay Presidency for the year 1931–32*, pp. 225–230, 1933.

Much of the information in this report has already been noticed from other sources, but the following items are of interest. One application of sulphur at flowering time usually suffices for the control of powdery mildew of peas [*Erysiphe polygoni*], the cost of the treatment being about Rs. 2 [3*s.* 0*d.*], and the quantity of sulphur required amounting to 25 lb. per acre. A second application may be given, if necessary, when the pods are formed and are still flat.

A species of *Alternaria*, believed to be new to science, causes a blight of cumin [*Cuminum cyminum*]. The incubation period of the fungus is three days, the infected plants collapsing within a week.

Further tests in the control of fig rust [*Cerotelium fici*: *R.A.M.*, xi, p. 282] indicated that 100 lb. of sulphur for five applications is the minimum quantity necessary to ensure reliable results. The fungicidal value of the sulphur was not appreciably impaired by the admixture of talc up to 20 per cent. of the weight of sulphur. The incubation period of the rust was found to be 14 days.

A race of bacteriophage has been isolated specific for *Pseudomonas citri*, the agent of citrus canker.

Sclerotium rolfsii was recorded on cotton, for the first time in the Bombay Presidency.

MCRAE (W.). **India: new diseases reported during the year 1932.**—*Internat. Bull. of Plant Protect.*, vii, 4, pp. 79–80, 1933.

Among the new plant diseases investigated in India during 1932 may be mentioned red stripe of sugar-cane (*Phytomonas rubrilineans*) [*R.A.M.*, xii, p. 245], *Sclerospora* sp. on *Panicum trypheron*, and *Polyporus ostreiformis* [ibid., vii, p. 704] causing heavy damage on areca palm [*Areca catechu*] in Calcutta.

WALLACE (G. B.). **Report of the Mycologist.**—*Ann. Rept. Dept. Agric. Tanganyika Territory 1932*, pp. 76–80, 1933.

During the period under review coffee rust (*Hemileia vastatrix*) in Tanganyika was most effectively controlled by two applications of Bordeaux mixture at half strength or one at full strength before the beginning of the heavy rains in March, followed by one half-strength application towards the end of the rainy period. *Cercospora coffeicola* was very abundant but was least common where the trees had been sprayed against *H. vastatrix* and in seed-beds shaded with pigeon pea. In one cacao plantation pod rot associated with a *Phytophthora* (?*faberi*) [*P. palmivora*] was abundant. Two species of *Rosellinia* were also recorded on the same host.

Maize was affected by head smut [*Sorosporium reilianum*: see below, p. 563] and the ear rots due to *Gibberella* [*moniliformis* and *G. saubinetii*: *R.A.M.*, xii, p. 201] and (in decreasing order of prevalence) *Diplodia macrospora*, *D. zeae*, and *D. frumenti*. Head smut appears to be confined to elevations of 5,000 ft. and over, one native plantation at 5,000 ft. showing complete loss of crop from this disease. Other fungi recorded on maize (old stalks) were *Phaeocytostroma ambigua*, *Melanconium saccharinum* (apparently new on this host), *Leptosphaeria orthogramma*, and *Clasterosporium lindavianum*.

Downy mildew [*Sclerospora* sp.: cf. ibid., ix, p. 373; xi, p. 634] caused considerable losses on sorghum; the Bonganhilo variety proved to be practically immune whilst Jebere, Karachi, Bangara, and Lugundugundu in a trial at Morogoro gave 9·6, 5·9, 10·8, and 10·7 per cent. infection, respectively. The value of sulphur treatment against sorghum smuts [*Sphacelotheca sorghi* and *S. cruenta*: ibid., xi, p. 235] was demonstrated and the method is being introduced into practice.

Sugar-cane suffered from a root disease due to *Armillaria* [*mellea*], probably the first record on this host. *Melanconium sacchari* and *Leptosphaeria sacchari* were also observed on the canes and leaves, respectively.

The most destructive diseases of sesame were a leaf curl probably caused by a virus, and a bacterial disease affecting the stems, branches, and leaves. Two leaf fungi attacking this host are an *Oospora* and a *Helminthosporium* provisionally referred to *H. gigasporum* subsp. *javanicum*.

Armillaria [*mellea*] was recorded on banana and was very destructive on cassava, the roots of the latter being rendered quite useless. A few perithecia probably of *Mycosphaerella manihotis* [ibid., v, p. 531] were found on angular spots on cassava leaves, mostly along the midribs.

DEIGHTON (F. C.). **Mycological work.**—*Ann. Rept. Agric. Dept. Sierra Leone for the year 1932*, pp. 20–23, 1933.

Towards the end of 1932, Cavendish bananas [*Musa cavendishii*] growing at Njala, Sierra Leone, became widely affected by black-tip (*Helminthosporium torulosum*) [*R.A.M.*, xi, p. 464], infection being followed by a cigar-end rot associated with a *Verticillium* [ibid., x, p. 504]. Leaf blotch of the same host was associated with *H. torulosum* and *Scoletotrichum musae*.

In a test of 14 different varieties of cassava, Mayugbe and Two Cent varieties proved to be very resistant to mosaic [ibid., xii, p. 202] and are being distributed by the Agricultural Department. The leaf fall and die-back of cassava recorded in 1931 [loc. cit.] was ascertained to be a normal response to dry season conditions.

Citrus scab [*Sporotrichum citri*] was observed on the Satsuma orange [*Citrus nobilis* var. *unshiu*] as well as on the hosts previously recorded [loc. cit.].

At Newton many grapefruit trees imported in 1929 were affected by gummosis, 22 out of 25 McCarty and a number of Duncan trees becoming infected. Some imported Genoa lemons at Njala budded on rough lemon [*C. limonia*] were also affected. No attempt was made to isolate the causal organism, but a strain of *Phytophthora parasitica* was isolated in 1929 from a similarly affected sweet orange [ibid., x, p. 81].

Rotting of citrus fruits in the field appeared to be a normal result of wounding by needle pricks or of injury by fruit-piercing moths; the fungi most commonly noted were strains of *Fusarium* and two yeasts, though *Oospora citri-aurantii*, *Gloeosporium*, *Phomopsis*, and *Diplodia* were occasionally isolated.

A leaf disease of obscure etiology affected oil palms [*Elaeis guineensis*] of the Deli type at Njala, starting, apparently, on the young, unopened spear-leaves; the newly expanded pinnae were often stuck together at their distal points and covered with a *Fusarium*, while a *Phyllosticta* was present on the older leaves.

A blossom-drop of avocado associated with a *Botrytis* was commonly present at Njala and in the event of plantations being established is likely to prove serious. When about to open the flowers became covered with the fungus and fell off, whole inflorescences sometimes dropping. *Jatropha podagrica* in the vicinity was similarly affected apparently by the same species. A zonate leaf blotch of avocado was associated with a *Colletotrichum* with sparse setae.

Other records include *Cercospora coffeicola* causing brown eye-spot of coffee berries, *Plasmopara viticola* on the vine, *Phyllosticta batatae* on sweet potato, *Aecidium tubulosum* (African form) on *Solanum incanum*, and the entomogenous fungi *Empusa fresenii* [ibid., xi, p. 640] on *Aphis laburni* on groundnuts and *Aschersonia marginata* Ell. & Ev. (*Hypocrella reineckiana* P. Henn.) on *Pulvinaria* sp. on guava and *Anisophyllea laurina*.

SHEPHERD (E. F. S.). **Botanical Division.**—*Ann. Rept. Mauritius Dept. of Agric. for 1931*, pp. 12–15, 1932.

The incidence of gummosis (*Bacterium vascularum*) and leaf scald (*Bact. albilineans*) stem infection on White Tanna sugar-cane, as revealed by a survey at the mill carriers in Mauritius in 1931, worked out as 5 and 9 per cent., respectively [*R.A.M.*, xi, p. 496]; this was approximately in accord with the ratio given by field observations. A preliminary experiment conducted on the resistant variety D.K. 74 indicated that both diseases are readily spread by means of the cutting knives. A leaf stripe disease formerly thought to be a stage of scald, and to which P.O.J. 2878

and White Tanna appear to be particularly susceptible, is now considered to be the Java 'fourth disease' [ibid., xi, p. 4].

The *Phytophthora* associated with collar rot of tobacco [ibid., xi, p. 496] was identified as a strain of *P. parasitica*. In the section of this report dealing with the work of the tobacco division (pp. 21 to 23) by G. Corbett it is stated that the disease appeared in epidemic form on certain plantations after heavy rains accompanying a cyclone in March. It disappears during cool weather and reappears with the summer rains. A proclamation issued in April, 1931, prohibited the transfer of tobacco seed or young plants from one plantation to another unless certified as unlikely to be infected.

Němec (B.). **Die Wurzelbildung an den bakteriellen Pflanzentumoren.** [Root formation by bacterial plant tumours.]—*Studies Plant Physiol. Lab. Charles Univ. Prague*, iv, 2, 66 pp., 1 fig., 1932. [English summary.]

In connexion with a study of the action of *Bacterium tumefaciens* on callus formation, the writer observed that the strain isolated from apples in the United States (subsequently named *Pseudomonas* [*Bact.*] *rhizogenes*) [*R.A.M.*, xi, p. 561] caused intensive callus production on the cut surface of the roots of chicory (*Cichorium intybus*), while at the same time completely suppressing the ordinarily profuse formation of shoots. In subsequent experiments the inoculated cut surfaces of decapitated epicotyls of horse-chestnut (*Aesculus hippocastanum*) seedlings produced a large, irregular callus on which adventitious buds and roots were formed, though the growth of the buds was very slow. The adventitious roots did not develop on normal callus, and the writer believes they are due to the secretion by the bacterium of some substance stimulating them while simultaneously retarding bud growth.

Okabe (N.). **Bacterial diseases of plants occurring in Formosa I.** —*Journ. Soc. Trop. Agric.*, iv, pp. 470–483, 5 figs., 1932.

The symptoms of the following bacterial diseases of plants in Formosa, Japan, are described, with notes on the morphology, physiology, and taxonomy of the causal organisms, and on the results of inoculation tests: bacterial pustule of soy-bean (probably *Bacterium phaseoli* var. *sojense* [*R.A.M.*, xi, pp. 18, 222, 772] though a close relationship with *Bact. phaseoli* and *Bact. glycines* is also indicated); bacterial leaf spot of castor bean (*Bact. ricini*) [ibid., viii, p. 221]; citrus canker (*Bact.* [*Pseudomonas*] *citri*) [ibid., x, p. 593] affecting 41 local species and varieties [which are listed]; bacterial black spot of radish (*Bact. maculicola*), also attacking several species of *Brassica*, including cauliflower [ibid., xi, pp. 146, 745]; black rot of crucifers (*Bact. campestre*) [*P. campestris*: ibid., xii, p. 425]; and angular leaf spot of cotton (*Bact. malvacearum*) [ibid., xii, p. 439].

Okabe (N.). **Bacterial diseases of plants occurring in Formosa II.**—*Journ. Soc. Trop. Agric.*, v, pp. 26–36, 3 figs., 1933.

Continuing his investigations on the bacterial diseases of plants in Formosa [see preceding abstract], the writer gives detailed

descriptions of a bacterial leaf spot of tomato, caused by *Bacterium tomato* n. sp., and of red stripe of sugar-cane leaves due to *Bact.* (*Phytomonas*) *rubrilineans* [*R.A.M.*, xii, p. 245].

Bacterial leaf spot of tomatoes is characterized by primary infection of the basal part of the plant, gradually extending to the younger leaves near the top. The lesions on the upper surface are at first yellowish-brown and water-soaked, later blackish-brown (paler on the under side), irregularly circular, and 1 to 3 mm. in diameter; at a more advanced stage the centres become sunken and papery with a pale yellowish-green halo (baryta yellow in severe infestations). The spots are often so densely crowded over the leaves as to give a yellow, shrivelled appearance, accompanied by raggedness of the margins and sometimes by distorted growth in the early stages.

The causal organism is a large rod with rounded ends, sometimes slightly curved, occurring singly or in pairs, occasionally in chains, with one to three polar flagella, and measuring 1·8 to 6·8 by 0·69 to 0·97 μ. Pseudozoogloeae are usually produced in liquid cultures. The colonies on beef extract agar are white, opalescent, circular, flat to slightly raised, with a smooth, glistening surface. Gelatine is liquefied, milk coagulated, and casein peptonized; acid is produced from dextrose, saccharose, and lactose, and a feeble diastatic action exerted on potato starch; ammonia is formed; a moderate growth is made in Uschinsky's solution (with bluish fluorescence) but none in Cohn's or Fermi's. The minimum, optimum, and maximum temperatures for development are below 5°, 20° to 25°, and 33° C., respectively, and the thermal death-point is 48°. The organism remains alive for six months on beef extract agar at low temperature, stains with aniline dyes, is Gram-negative, non-acid-fast, and can retain its virulence for more than a year. Desiccation is withstood for 12 but not for 24 hours. Inoculation experiments with water suspensions gave positive results on tomato and eggplant, the latter, however, seldom contracting the disease in a severe form. *Bact. vesicatorium* [ibid., xi, pp. 355, 772, 803, 804] produces closely similar symptoms on the leaves but differs from the new organism in its capacity to attack other organs and also in its cultural characters (yellow colonies, capsulate, no growth in Uschinsky's but some in Fermi's solution, optimum and maximum temperatures for growth 27° to 30° and 40°, respectively).

Red stripe of sugar-cane is characterized by the occurrence on the leaves of long, narrow, deep red or maroon-coloured, longitudinal stripes, 0·15 to 2 mm. wide. The causal organism differs to some extent in pathogenicity and cultural characters from *P. rubrilineans* as originally described from Hawaii. Thus, in the latter country the stripes are reported to extend occasionally down to the leaf sheath, while in severe cases top rot may be a feature of the disease, neither of which manifestations was observed by the writer on Badila (resistant to *P. rubrilineans* in Hawaii) and P.O.J. 2878 canes in Taihoku. Moreover, the Hawaiian organism liquefies gelatine and reduces litmus completely, but scarcely changes the reaction of milk, whereas the Japanese form neither liquefies gelatine nor reduces litmus but

shifts the reaction of milk in the alkaline direction. The Javanese red stripe organism has been referred to *P. rubrilineans* [ibid., ix, p. 679] notwithstanding slight differences from the Hawaiian form and for the present the newly discovered Japanese organism is included under the same binomial.

PELTIER (G. L.). **Physiologic forms of Wheat stem rust in Kansas and Nebraska.**—*Phytopath.*, xxiii, 4, pp. 343–356, 6 maps, 1933.

The writer has continued his studies on the primary sources of wheat stem rust (*Puccinia graminis tritici*) in Kansas and Nebraska [*R.A.M.*, ix, p. 97 ; xii, p. 360], the present observations on the spread of the fungus and the occurrence of physiologic forms covering the period from 1928–30.

In the majority of cases infected barberry bushes in northern Kansas were found to be spreading *P. g. secalis* to adjacent cereals and susceptible grasses (*Agropyron smithii*, *Hordeum pusillum*, *H. jubatum* [ibid., xii, p. 273], and *Hystrix patula*). In Nebraska only one infected bush was observed spreading *P. g. tritici* prior to the appearance of primary uredosori not directly traceable to barberries. Uredosori were found during the first week in June in Kansas and by the second week in southern Nebraska in 1929 and 1930, appearing somewhat later in 1928. No appreciable loss from wheat stem rust occurred in either State during the three years over which the observations extended.

Five physiologic forms were identified from the Kansas collections, form 36 being predominant and present as primary uredosori, 15, 14, and 38 more sparsely but fairly evenly distributed, while only one collection of 49 was detected in the south-east [cf. ibid., xii, pp. 14, 427]. Form 36 was also the most prevalent in Nebraska, where 34 and 38 were also comparatively common and 56 was isolated from material from the southern part of the State. The available evidence suggests that there is a movement of uredospores from local overwintering centres in the southern States, e.g., Texas, Oklahoma, Missouri, and Arkansas, into Kansas and Nebraska each season. The exact amount and distribution of wind-blown uredospores thus reaching Kansas and Nebraska cannot be accurately determined, since some of the inoculum originates from infected barberries not yet eradicated in these and adjacent States.

STROEDE (W.). **Ueber den Einfluss von Temperatur und Licht auf die Keimung der Uredosporen von Puccinia glumarum f. sp. tritici (Schmidt) Erikss. et Henn.** [On the influence of temperature and light on uredospore germination in *Puccinia glumarum* f. sp. *tritici* (Schmidt) Erikss. et Henn.]—*Phytopath. Zeitschr.*, v, 6, pp. 613–624, 3 graphs, 1933.

In continuation of Stock's investigations [*R.A.M.*, x, p. 587], the writer studied the effect of temperature and light on uredospore germination in yellow rust of wheat (*Puccinia glumarum* f. sp. *tritici*) [ibid., x, p. 714].

The optimum temperature for germination was found to be 11° C., at which point 100 per cent. germination took place within

six hours. All the uredospores germinated also at higher temperatures up to 20°, but the average duration of the process was considerably lengthened (up to 72 hours). The optimum for *P. glumarum* is thus much lower than the corresponding points for the species previously studied [ibid., x, p. 587]. The maximum temperature for germination in *P. glumarum* was found to be 25° as compared with over 30° for the other rusts, while the minimum corresponds with that of *P. secalina* (just above 0°).

Both natural and artificial light retarded the process of germination in *P. glumarum*, which in this respect resembles *P. graminis*. Old spores (8 to 10 days) germinated much more slowly than young ones (2 to 3 days) at temperatures above 16°.

STRAIB (W.). **Über Gelbrostanfälligkeit und -resistenz in den verschiedenen Triticum-Reihen.** [On susceptibility and resistance to yellow rust in the various *Triticum* groups.]—*Zeitschr. für Züchtung*, A, xviii, 2–3, pp. 223–240, 1933.

A fully tabulated account is given of the writer's experiments, at the Brunswick Institute of Agricultural Botany, to determine the reaction to 14 biologic forms of yellow rust (*Puccinia glumarum*) of 290 species and varieties of wheat belonging to 11 groups [*R.A.M.*, xii, p. 273].

In the *monococcum* group marked differences in reaction were observed both among the varieties of *Triticum aegilopoides* and among those of *T. monococcum*. *T. aegilopoides* var. *boeoticum*, for instance, showed a much slighter degree of infection than the vars. *thaoudar* and *zuccariori* of the same species. *T. monococcum* var. *laetissimum* and most strains of var. *vulgare* proved highly susceptible, whereas the vars. *hornemanni* and in particular *flavescens* gave consistent evidence of resistance. *T. dicoccoides* var. *spontaneonigrum* was almost uniformly resistant, while certain biologic forms of *P. glumarum* caused heavy infection on the vars. *fulvovillosum* and *spontaneovillosum*. As a whole, the *dicoccum* group is characterized by a striking lack of uniformity in its response to infection by *P. glumarum*, the different biologic forms of which produce varying results. Most of the representatives of *T. spelta* were susceptible, only one *album* kind known as Emmer aus Tzaribrod showing a high degree of resistance to all biologic forms of the rust. *T. compactum* was also predominantly susceptible, though some varieties were highly resistant to forms 10 to 14 [ibid., xii, p. 272]. The majority of the German winter wheat varieties (*T. spelta* var. *vulgare*) proved immune from, or highly resistant to, forms 11, 12 (Austrian), 13 (Canadian), and 14 (Finnish), while both winter and summer varieties are in general severely attacked by most of the German biologic forms of the rust. Form 9, however, is to some extent exceptional, since it spares a large number of winter wheats while attacking the summer varieties with consistent severity.

The results of these investigations do not support Vavilov's conclusions (*Ann. Acad. Agron. Petrovskoe*, iii, p. 1, 1918) as to the phylogenetic basis of resistance and susceptibility in the different wheat groups. Both resistant and susceptible varieties have been found in each of the groups tested, the reaction of the individual

variety depending rather on the virulence or otherwise of the particular biologic form used than on any inherent predisposition in the wheats. Reaction to yellow rust, therefore, cannot be used as a reliable criterion in the classification and delimitation of wheat species and varieties, and the bearing of this observation on genetic procedure is briefly discussed.

MILAN (A.). **Il numerò delle cariossidi sulle spiche di Grano sane e cariate in confronto.** [The numbers of caryopses on healthy and bunted Wheat ears compared.]—*Nuovo Giorn. Bot. Ital.*, N.S., xl, 1, pp. 78–93, 4 pl. (facing p. 182), 2 charts, 1933.

An account is given of the author's further studies conducted in the lower valley of the Po of the effects produced on wheat by bunt attack (*Tilletia tritici* and *T. levis*) [*T. caries* and *T. foetens*: *R.A.M.*, xii, p. 209]. The results [which are tabulated and expressed graphically] may very briefly be summarized as follows. In both early and late varieties bunted ears always contain more caryopses than healthy ones at the same stage of growth. When attacked by the mycelium the ovaries become hypertrophied. The average number of caryopses in healthy and bunted ears varies with the date of sowing. Late varieties sown on dates far removed from that best suited to them suffer reduction in fertility; on the other hand, when early varieties are sown too late their fertility increases. It is evident that, particularly in late varieties sown late, the host may become extinct owing to loss of fertility, while the parasite would still be able to survive. Under normal field conditions in the lower Po valley the precocity of some varieties can be so accentuated that grain can be obtained whatever the date of sowing; using such varieties, the fructification of *T. caries* and *T. foetens* can be brought about at any time of the season.

ARNAUD (G.) & GAUDINEAU (Mlle M.). **Sur le traitement de la carie du Blé.** [On the treatment of Wheat bunt.]—*Comptes rendus Acad. d'Agric. de France*, xix, 13, pp. 465–469, 1933.

The salient points in this account of the writers' continued investigations on the control of wheat bunt [*Tilletia caries* and *T. foetens*] in France have already been noticed from another source [*R.A.M.*, xii, p. 429].

FRIEDRICHS (G.). **Die Bestimmung des Bestäubungsgrades trockengebeizten Saatgetreides bei der Lohnbeizkontrolle.** [The determination of the adhesiveness of dusts to treated cereal seed-grain in the supervision of co-operative disinfection plants.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 4, pp. 25–27, 1933.

Details are given of a colorimetric method of testing disinfectant dusts for their adhesive capacity [*R.A.M.*, xi, p. 502], based on the admixture with the fungicidal substance of a dye which, on slightly moistening the cereal seed-grain, colours the latter to a varying degree according to the amount applied. This method, worked out in Holland by W. B. L. Verhoeven on the suggestion

of A. Winkelmann [ibid., viii, p. 366], has been adapted by the writer with highly satisfactory results in his work as supervisor of the Westphalian co-operative seed-grain disinfection plants [ibid., xi, p. 707].

Djelaloff (R.). Опыты по головне (**1929-30** и **1930-31** г.г.). [Experiments on bunt (1929–30 and 1930–31 seasons).]—Pamphlet issued by *Азербайджанский Сел.-Хоз. Инст.* [*Azerbaijan Agric. Inst.*], Baku, 52 pp., 5 graphs, 1932. [English summary. Received July, 1933.]

This is a detailed account of experiments in the 1929–31 seasons in several localities of Azerbaijan [Caspian littoral of the Caucasus] for the purpose of determining the relative efficacy of various seed-grain treatments in the control of wheat bunt (*Tilletia levis*) [*T. foetens*]. The results [which are presented in the form of tables and graphs] showed that all the fungicides tested, with the exception of calcium arsenite dust containing 12·5 per cent. As_2O_3, impaired the germinability of the seed and the vigour of the surviving seedlings, the loss of yield entailed being, in most cases, greater than that caused by the disease. Comparative tests showed that spore load is an important factor in the efficacy of the fungicides [*R.A.M.*, xi, p. 289], since with grain contaminated with 0·1 gm. bunt spores per 100 gm., even the weakest preparations gave good control, while at the rate of 1 gm. none was effective except formalin and calcium arsenite dust (72 per cent. As_2O_3). The date of sowing also affected the efficacy of the preparations (except formalin), their action both on the seedlings and on the bunt being weakest at the later winter sowings, i.e., when the soil temperature was lowest and its moisture content highest. It also had a bearing on the incidence of the bunt, independently of the fungicides, since seed-grain dusted with the same amount of *T. foetens* spores and sown on the 1st and 15th November and 7th December, gave 71·68, 44·0 and 15·7 per cent. bunt, respectively, in the ensuing crops. Under the local conditions, the best control was obtained with the dust preparation AB (25·74 per cent. CuO), calcium arsenite (12·5 per cent. As_2O_3), and chrompik [composition not indicated] at the rate of 0·5 gm. per 100 gm. grain.

Resistance tests in 1930–1 showed that, while no wheat varieties were immune from bunt, the greatest resistance was exhibited by Daghestan-bred lines of all the varieties, as well as by pure lines of the Co-operatorka wheat. There was evidence that the higher resistance of the *durum* wheats, noted by many other workers, is mainly dependent on ecological conditions, since under certain combinations of these factors, these wheats were as susceptible as the *vulgare* varieties. In infection experiments on barley and wheat with *T. pančičii* [ibid., iv, p. 665], this bunt proved to be weakly virulent to three out of ten varieties of barley tested, and gave no infection on wheat.

Djelaloff (R.). Головня Хлебных злаков в Азербайджане. [Cereal smuts in Azerbaijan.]—Pamphlet issued by *Азербайджанский Научно-Исследов. Инст.* [*Azerbaijan Scientific Res.*

Inst.], Baku, 33 pp., 1932. [In the Azerbaijan language, with Russian translation, and English summary. Received July, 1933.]

The results of a survey in 1930 for the purpose of determining the distribution and economic importance of cereal smuts in Azerbaijan showed that in that republic wheat suffers most from bunt, the percentage of infection in 1929 having varied from 0·1 to 19·8, with an average of 2·6. Of the two species involved *Tilletia levis* [*T. foetens*] is present all over the country, while *T. tritici* [*T. caries*] occurs in two localities of the Cuba district, to which it was probably introduced with seed-grain from other regions of Russia. Field observations indicated that irrigated wheat suffered less from bunt than that on non-irrigated soil, and that good tillage appeared also to reduce the incidence of the disease. Disinfection in 1929 of 18 per cent. of the total cereal seed-grain involving an expenditure of under 30,000 roubles [nominally £3,000] is estimated to have saved 1,375 tons of the cereals, valued at 137,800 roubles. Loose smut (*Ustilago tritici*) is widespread, but does little damage, the maximum percentage infection observed being 2·4.

Barley is chiefly attacked by covered smut (*U. jenseni*) [*U. hordei* Kellerm. & Swing.], the percentage of infection noted fluctuating from 0·1 to 15·8. Loose smut (*U. hordei* Bref.) [*U. nuda*] is considerably less prevalent, the maximum infection in autumn-sown barley being 6·9 per cent. and in the spring-sown 0·8 per cent. Besides these two smuts, a very slight infection of barley with *U. pančiči* [see preceding abstract] was found in a locality of the Cuba district; this is believed to be the first record of this species for Russia. Oats, a minor crop, are attacked by *U. avenae* and *U. levis* [*U. kolleri*], the latter being the more frequent.

Foëx (E.) & Rosella (E.). **Note expérimentale sur l'un des piétins du Blé.** [Experimental note on one of the foot rots of Wheat.]—*Comptes rendus Acad. d'Agric. de France*, xix, 13, pp. 470–474, 1933.

Cercosporella herpotrichoides [*R.A.M.*, xii, p. 430] is generally supposed to cause relatively little damage to spring wheat in France as compared with the autumn crop, but as the affected plants are entirely destroyed and disappear it is difficult to estimate the losses from this source, which are probably considerable. In 1930–1 late autumn sowings of Bon Fermier were found to give a superior yield both to those of 1st October and to the spring plantings. Deep sowing (5 to 8 cm.) was found to promote infection by foot rot, wide spacing between the lines (30 cm.) to reduce it. The beneficial effects of spraying with sulphuric acid (9 per cent. for the first application and 12 per cent. for subsequent ones) were found to be only transitory, ceasing with the advent of rainy weather.

Greaney (F. J.) & Machacek (J. E.). **Production of a white fertile saltant of Helminthosporium sativum by means of ultra-violet radiation.**—*Phytopath.*, xxiii, 4, pp. 379–383, 2 figs., 1933.

Ultra-violet irradiation of strains of *Helminthosporium sativum*

isolated from cereals in Canada [see next abstract] produced a decided increase in the frequency of saltation, while in the susceptible strains there was a marked suppression of growth [cf. *R.A.M.*, xii, p. 316]. So far the saltants have remained constant. One irradiated strain of the fungus produced a strongly sporulating, albinistic saltant, the spores and mycelium of which are hyaline, but pale pink in the mass. The mutant was shown by field and greenhouse experiments to be equally virulent with the parent; it was recovered unchanged from the diseased plant parts.

Sallans (B. J.). **Methods of inoculation of Wheat with Helminthosporium sativum P.K. and B.**—*Scient. Agric.*, xiii, 8, pp. 515–527, 1 fig., 1933. [French summary on p. 542.]

The results of comparative experiments showed that for the purpose of studying the various problems connected with the diseases of wheat caused by *Helminthosporium sativum* in Western Canada [*R.A.M.*, xi, p. 293] the method of inoculation of the seed-grain by soaking in a suspension of the spores of the fungus is the most suitable. Drying the seed-grain afterwards did not affect adversely infection and facilitated extensive experiments by allowing the use of seed drills. The severity of infection thus produced was considerably increased by incubating the treated seed for 18 to 27 hours at 24° C.; this allowed the conidia to germinate on the seed, producing short, much branched germ-tubes, some of which penetrated the epidermis of the pericarp, with the probable result that when the seed was sown, a large amount of mycelium was present around the plumule and coleorhiza as soon as they emerged through the pericarp. Longer periods of incubation were detrimental in that they resulted in the germination of the seed before sowing. The method is capable of standardization by regulating the concentration of the spores in the suspension, the even distribution of moisture on the seed, the temperature, and the length of incubation. The age of the culture from which the spores were derived was shown to be an important factor, two-week-old cultures having been found to be the most suitable by the author.

Inoculation of the soil with cultures of *H. sativum* on mashes prepared from grains or parts thereof was found to be effective but unsatisfactory, in that the addition of such uninoculated media to the controls was shown to result in severe injury to the seedlings.

Broadfoot (W. C.) & Robertson (H. T.). **Pseudo-black chaff of Reward Wheat.**—*Scient. Agric.*, xiii, 8, pp. 512–514, 1 pl., 1933. [French summary on p. 542.]

A brief description is given of a discoloration, simulating black chaff (*Bacterium translucens undulosum*) [*R.A.M.*, xi, p. 434; xii, p. 13] of wheat, which has been observed every year since 1929 in Alberta on Reward wheat, and occasionally also on Marquis. The discoloration was confined almost entirely to the glumes and the rachis, especially in those parts which were exposed to light. Histological and cultural studies showed that the condition is not due to the activity of parasitic organisms, but is probably due to

the fact that some strains of Reward wheat still carry colour factors which, under suitable light conditions, produce the pigmented areas.

Reed (G. M.). **Reports on research for 1932. Plant pathology.** —*Twenty-second Ann. Rept. Brooklyn Bot. Gard.*, 1932 (*Brooklyn Bot. Gard. Record*, xxii, 2), pp. 53–57, 1933.

Of 88 F_3 progenies of Hybrid 16 (Gothland × Victor) inoculated with covered smut of oats [*Ustilago kolleri*: *R.A.M.*, xi, p. 506], 32 were classified as resistant (no infection), 44 segregating (under 50 per cent. smut), and 12 susceptible (up to 100 per cent. diseased). As usual, the Gothland parent remained quite free from covered smut, while Victor showed almost 100 per cent. infection. Both these varieties are highly susceptible to loose smut [*U. avenae*], and out of 28 F_3 progenies (633 plants) inoculated with this fungus, 603 (95·2 per cent.) contracted infection. Of 40 F_3 progenies of Hybrid 18 (susceptible Silvermine × resistant Black Mesdag) inoculated with loose smut, 15 were resistant, 18 segregating, and 7 susceptible, the corresponding figures for 42 inoculated with covered smut being 15, 21, and 6, respectively. Of 71 F_3 progenies of Hybrids 34, 35, and 36 (susceptible Early Champion × Black Mesdag) inoculated with *U. avenae*, 17 were resistant, 31 segregating, and 23 susceptible, the corresponding figures for the 72 inoculated with *U. kolleri* being 21, 40, and 11, respectively.

Nearly all the 286 F_4 progenies of Hybrids 17, 18, 33 (Early Champion × Black Mesdag), 34, 35, and 36 were pure resistants to both smuts, four of the five exceptions (descendants of 36) showing less than 50 per cent. infection and one more.

Of 98 F_3 progenies of Hybrids 29, 30, 31, and 32 (Fulghum × Black Mesdag) inoculated with a strain of *U. avenae* to which the first-named parent is highly susceptible, 27 were resistant, 47 segregating, and 24 susceptible. Evidence is available that the strain of loose smut occurring on Fulghum is differentiated into more than one race.

In general, the maximum percentages of infection by the oat smuts are obtained at about 20° C., little or none occurring on plants germinated at 30°; one race of *U. kolleri*, however, caused a fairly high incidence of infection at the latter temperature.

Somers (L. A.). **Bacterial wilt or Stewart's disease of sweet Corn.**—*Trans. Illinois State Hort. Soc.*, lxvi (*1932*), pp. 336–347, 1933.

Extremely heavy damage was caused in 1931 and 1932 in Illinois by the bacterial wilt of maize [*Aplanobacter stewarti*: *R.A.M.*, xii, p. 364]. In the latter year nearly every plant in each of the 66 fields inspected by B. Koehler and J. R. Holbert showed the presence of leaf blight, the loss of green leaf area ranging from a trace to 50 per cent. with an average of 16·6 per cent. Stalks with yellow vascular bundles were also found in nearly every field examined, the incidence being as high as 85 per cent. in one, with an average of 6·2 for all. In some cases between 45 and 47 per cent. of the plants were prematurely killed, either by bacterial

wilt alone or as a result of secondary infection by *Diplodia* [*zeae*]. In some plants the bacterial exudation from pores on the inner husks was so profuse that the kernels were literally covered. In addition to the usual cultural measures (including crop rotation) and seed treatment, the Smith selections, especially Golden Cross Bantam, and some top crosses from Purdue 39 and 51 should be extensively tested for resistance.

Němec (B.). **Die Brandbeulen von Ustilago maydis.** [The smut galls of *Ustilago maydis*.]—*Studies Plant Physiol. Lab. Charles Univ. Prague*, iv, 2, 22 pp., 10 figs., 1932. [English summary.]

The swellings produced by *Ustilago maydis* [*U. zeae*: *R.A.M.*, xii, p. 365] were shown, by the writer's examination of fixed material, to arise exogenously and start by the enlargement and subsequent division of both epidermal and cortical stem cells. The parenchymatous cells of the xylem and phloem of the outer longitudinal vascular bundles may also participate in the development of the gall, while a few outer cells of the sclerenchyma strands may be involved. The gall consists of the epidermis, a parenchymatous ground tissue, and an irregular net of bundles, mostly phloem bundles.

The parenchymatous ground tissue is substantially composed of diploid cells, among which are many tetraploid and some giant polyploid cells with one large or two or more smaller nuclei. Different stages of nuclear fusion have been observed in many cells, this process and repeated mitosis resulting in the formation of the large polyploid cells.

During the process of sporulation the galls cease to develop further and ultimately die. No correlation exists between polyploidy and the etiology of the tumours, the former resulting from abnormal conditions within the latter.

Bressman (E. N.). **Experiments with head smut of Corn in western Oregon.**—*Phytopath.*, xxiii, 4, pp. 396–403, 1 fig., 1933.

Head smut of maize (*Sorosporium reilianum*) [*R.A.M.*, xii, p. 165] has been observed in a destructive form in parts of western Oregon, affecting 90 per cent. of the crop near Salem in 1930 and causing heavy damage.

Greenhouse experiments in 1931 showed that the disease is transmissible to some extent by seed-borne spores, infection by which was found to be preventable by a number of chemical treatments, including 50 per cent. copper carbonate dust, landplaster (powdered gypsum), and powdered paraformaldehyde. In field trials, however, none of the treatments used gave effective protection against contamination through the soil; even formaldehyde solution, applied to the seed and the soil, was ineffective. The sole indication of infection in 11 per cent. of the diseased plants in the field trials and 17 per cent. in the greenhouse experiments was the abnormal vegetative proliferation of the ears.

The local strain of *S. reilianum* was not transmissible in greenhouse tests to six varieties of sorghum [ibid., vi, p. 548] and it is

considered safe therefore to use sorghum in rotation on infected land. Of the six maize varieties, namely, Minnesota No. 13, 'Schucking', Golden Glow, McKay Dent, Putnam Red, and African White, planted without treatment in smut-contaminated soil at Salem, none showed a marked degree of resistance.

VOORHEES (R. K.). **Gibberella moniliformis on Corn.**—*Phytopath.*, xxiii, 4, pp. 368–378, 3 figs., 1933.

Gibberella moniliformis [*R.A.M.*, xi, pp. 399, 569] is stated to be one of the most prevalent maize seed parasites in Florida, where the annual reduction in yield from this source is estimated at 5 per cent. of the crop. The symptoms caused by the fungus are outlined and the morphological characters of the imperfect and perfect stages described.

The perithecial stage was found occurring naturally on maize and was produced on standard media (of which potato-dextrose agar was the best) in pure culture by pairing multisporous cultures derived from macro- and microconidia, and also by inoculating maize stalks with multisporous cultures singly and in combination. Mono-ascospore cultures isolated from maize leaf sheaths produced perithecia in abundance.

The microconidia of *G. moniliformis* germinated in water at a temperature range between 11° and 35° C., the optimum being close to 30°. On potato-dextrose agar the minimum, optimum, and maximum temperatures for mycelial growth were found to be 10° to 14°, 30°, and 35° to 39°, respectively.

In modified rag doll germination tests of seed ears of the Whatley, Tisdale, Cuban Yellow Flint, and Powell's White Dent maize varieties, *G. moniliformis* weakened or killed the kernels in some cases, while in others no effects were noticeable. The roots and mesocotyls of maize seedlings grown in sterilized soil inoculated with the fungus were retarded in development or killed. In plot tests conducted in 1929–30 the yields from seed infected by *G. moniliformis* were less than those from healthy seed in all but one test, the maximum difference in favour of healthy seed being 5·5 bushels.

HIRATA (E.) & TAKENOUTI (H.). **Studies on the morphological and physiological characters of Sclerospora graminicola on Setaria italica.**—*Ann. Agric. Exper. Stat., Gov.-Gen. Chosen*, vi, pp. 157–200, 2 pl., 1932. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 3, p. (66), 1933.]

The mycelium of *Sclerospora graminicola* runs intercellularly through the tissues of *Setaria italica* [*R.A.M.*, xii, p. 433], seldom emerging through the stomata. Each conidium produces 2 to 3 biciliate zoospores while the oospores germinate by a single germ-tube. Conidiophores and conidia develop constantly as long as the leaf surface is wet and the temperature fluctuates between 12·5° and 27° C. The germination of conidia and zoospores takes place when these organs are immersed in water and receive an adequate supply of air within the temperature limits of 12·5° to 29°, the process being unaffected by light. The oospores germinate under

similar conditions between 12·5° and 35°; in a dormant state they may retain their viability for eight months.

Savastano (G.). **Gli sviluppi più recenti delle ricerche sulle malattie degli Agrumi in Italia.** [Recent developments in the study of Citrus diseases in Italy.]—*Italia Agric.*, lxx, pp. 343–350, 1933. [Abs. in *Hort. Abstracts*, Imper. Bureau of Fruit Production, iii, 2, p. 82, 1933.]

The more important diseases of citrus in Italy are discussed in some detail, including root rot (*Phytophthora citrophthora* and *P. parasitica*) [*R.A.M.*, xii, p. 281] and 'mal secco' (*Deuterophoma tracheiphila*) [ibid., xii, p. 214]. For the control of the latter disorder, Prof. Petri recommends that lemons replanted in infected zones should be double worked on sour orange [*Citrus aurantium* var. *bigaradia*] with mandarin, which is resistant, as the middle stock. The use of the resistant Interdonato lemon variety is also advised. Legislation is in force to prevent the entry into Italy of *Bacterium* [*Pseudomonas*] *citri*, *Corticium salmonicolor*, *Sphaeropsis tumefaciens* [ibid., xi, pp. 283, 625], and *Gloeosporium limetticolum*.

Nelson (R.). **Some storage and transportational diseases of Citrus fruits apparently due to suboxidation.**—*Journ. Agric. Res.*, xlvi, 8, pp. 695–713, 6 pl., 1933.

The author states that the results of his studies [details of which are given] showed that the surface blemishes of citrus fruits described by previous workers under the names of cold storage spot or pox of grapefruits and oranges [*R.A.M.*, v, p. 735; x, p. 80], and brown spot [ibid., v, p. 735] and brown stain (Thompson, Putterill, & Hobson, *S. Africa Dept. Agric. Bull.*, 1, 1922) of navel oranges are caused by a breakdown of the rind tissues following storage under conditions of poor ventilation or in temperatures low enough to inhibit normal respiratory functions of the fruit.

Typical symptoms of cold storage spot and brown spot were experimentally produced by keeping susceptible fruits in a nitrogen atmosphere for four to ten days, and also in atmospheres of various composition; movement of the atmosphere in the containers without renewal was not effective in preventing their development. Analogous symptoms were also obtained at temperatures between 32° and 42° F. even when there was a sufficiency of oxygen, the susceptibility of the oranges and grapefruits varying with their degree of maturity, green fruits usually being the more susceptible. Finally, lesions resembling those of storage spot and brown spot were produced on oranges and grapefruits that were exposed to the vapours of acetaldehyde, acetic acid, or of a mixture of these substances, the degree of injury also depending on the maturity of the fruit. Both spots appear to arise from injuries to the parenchyma cells surrounding the oil vesicles, and the effect of acetaldehyde and fruit esters on the fruits suggests that some substance having a similar action may be involved in the causation or the accentuation of the injury following storage at low temperatures. Although in most cases oiled wrappers did not decrease the

incidence of either spot on grapefruits and oranges, in a few cases they appeared to have a beneficial effect.

Brown stain is a surface blemish of oranges, occurring on fruit in storage. The disease presents many similarities to apple scald and, except in severe cases, there is no marked depression as occurs in brown spot and storage spot. Injury closely resembling brown stain was produced on navel oranges by exposure to dilute vapours of certain chemicals, among which citral was particularly effective, and also with various acetates which cause scald-like effects on apples.

DEY (P. K.). **Studies in the physiology of the appressorium of Colletotrichum gloeosporioides.**—*Ann. of Botany*, xlvii, 186, pp. 305–312, 1 pl., 1933.

From a study of the formation and function of the appressorium in *Colletotrichum gloeosporioides* on *Citrus medica* var. *acida* the author found that the fungus infects the young leaves through a fine infection hypha produced from the surface of the appressorium in contact with the leaf cuticle. The latter is thought to be pierced mechanically in consequence of the continuous and increasing pressure exerted by the infection hypha [cf. *R.A.M.*, vii, p. 258], a mechanism comparable with that of *C. lindemuthianum* (*Ann. of Botany*, xxxiii, p. 305, 1919). There was evidence that the formation of the infection hypha is stimulated by the diffusion of nutrient substances through the uninjured cuticle and it was further shown that the appressoria of *C. gloeosporioides* do not withstand drying.

BUTLER (E. J.). **Cotton diseases.**—*Empire Cotton Growing Review*, x, 2, pp. 91–99, 1933.

Short, popular notes are given on the geographical distribution, symptoms, causal organisms, losses caused by, and control of the following major diseases of cotton, viz., root rot (*Phymatotrichum omnivorum*) [*R.A.M.*, xii, p. 287], wilt (*Fusarium vasinfectum*, *F.* spp., and *Verticillium albo-atrum*) [ibid., xi, pp. 513, 514], black-arm (*Bacterium malvacearum*) [ibid., xii, pp. 439, 507], anthracnose (*Glomerella gossypii*) [ibid., xi, p. 638], sore shin due to *Rhizoctonia* (*Corticium*) *solani* [loc. cit.], and stigmatomycosis due to one or other of *Nematospora coryli* [ibid., xii, p. 438], *N. gossypii* [loc. cit.], *N. nagpuri* [ibid., x, p. 101], *Spermophthora gossypii* [ibid., xi, p. 606], and *Eremothecium cymbalariae* [cf. ibid., viii, p. 485]. Several minor or less widely distributed diseases are also briefly referred to.

Annual Report of the Indian Central Cotton Committee, Bombay, for the year ending 31st August 1932.—136 pp., 1933.

The following references of phytopathological interest occur in this report. The seed of the Jayawant cotton variety, a cross between Dharwar 1 and 2 which combines productivity with resistance to wilt (*Fusarium vasinfectum*) [*R.A.M.*, xii, p. 508], is being distributed through the agency of the Central Committee and is already in cultivation over an area of nearly 140,000 acres. The Dharwar wilt scheme, inaugurated in 1923 to check the

spread of infection on local cottons, was terminated in 1932. During the period of its activity, the following important facts were elicited by researches carried out under the wilt scheme. *F. vasinfectum* consists of a number of physiologic forms. The temperature range of the fungus on agar was found to extend from 18° to 40° C. The disease is most severe at a soil temperature of 20° to 27°, decreasing at 28° to 31° and being completely arrested at 32° [ibid., xi, p. 781]. Infection is carried by the seed.

In the Central Provinces the Bani E.B. 31 variety has again given satisfactory results, while a new strain of [*Gossypium neglectum*] *verum* 438 is also very promising—even more so than the resistant 262.

In Sind all the Egyptian varieties appear to suffer from 'red leaf' disease.

In August, 1932, a scheme for the investigation of root rot [ibid., xi, p. 453] in the Punjab was sanctioned for a period of three years. The disease affects both American and local cottons, mainly in the canal-irrigated tracts, causing an estimated annual damage of Rs. 15,75,000 [£118,125]. A species of *Fusarium* has been found to occur in the diseased plants. Infection usually starts in the last week of June and continues until the middle of September, spreading in a circle among the healthy plants and causing rapid desiccation. A similar scheme was initiated in February, 1932, for two years in Baroda.

RYBERG (O.). **Cordiceps militaris (L.) Link. Några bidrag till kännedomen om dess förekomst och värddjur.** [*Cordyceps militaris* (L.) Link. Some contributions to the knowledge of its distribution and insect hosts.]—*Bot. Notiser, 1933*, 1-3, pp. 417-420, 1933.

The writer records the detection of *Cordyceps militaris* in six more localities of Sweden, bringing the total for the country to 15 [*R.A.M.*, ii, p. 76]; possibly the fungus may be more widespread than these figures indicate. In 1927 it was reported from Denmark in fair numbers on *Phalera bucephala*, also a common host of the fungus in Sweden. Some economic importance may possibly attach to its occurrence on *P. bucephala*, as this polyphagous pest causes heavy damage in orchards and plantations.

Three additional species of *Cordyceps* have recently been found in Sweden, namely, *C. cinerea* on a Carabid larva, *C. clavulata* on a Coccid (both new records for the country), and *C. sphingium* on a Noctuid.

BERGER (E. W.). **The latest concerning natural enemies of Citrus insects.**—Reprinted from *Proc. Florida State Hort. Soc., 1932*, 4 pp., 1932. [Abs. in *Rev. Appl. Entomol.*, Ser. A., xxi, 6, pp. 289-290, 1933.]

In the part of this paper dealing with the fungal parasites of the insect pests of citrus trees in Florida [*R.A.M.*, vi, p. 419] the author mentions 16 species of entomogenous fungi, the use of which in the control of the insects is briefly discussed. Periods of moisture and warmth are important factors in success and heavy cover crops assist considerably in conserving the degree of moisture

required. It is calculated that the use of *Aschersonia aleyrodis* [loc. cit.] alone for combating whiteflies effects an annual saving to the State of about £530,000, by doing away with the necessity of at least one application of an oil spray.

Shrewsbury (J. F. D.). **Rhinosporidiosis.**—*Journ. of Path. & Bact.*, xxxvi, 3, pp. 431–434, 4 pl., 1933.

A brief account is given of the history of rhinosporidiosis caused by *Rhinosporidium seeberi* [*R.A.M.*, xi, p. 641], with a summary of the life-cycle of the causal organism based on Ashworth's observations [ibid., iii, p. 153]. Attention is directed to the early appearance, regularity of growth, and uniform size of the spherules (regarded by Ashworth as proteinaceous particles) in the spores. Attempts to culture *R. seeberi* from material obtained from Calcutta failed. The study of stained sections from the tumours confirmed Ashworth's observations in most particulars, but an earlier stage of the parasite is apparently represented than any figured in his paper.

Ayyar (V. K.). **Rhinosporidiosis in equines.**—*Indian Journ. Vet. Sci. and Animal Husb.*, xi, pp. 49–52, 11 figs., 1932. [Abs. in *Veterinary Bull.*, iii, 4, p. 182, 1933.]

The author describes a case of rhinosporidiosis [*Rhinosporidium* (?) *seeberi*: *R.A.M.*, ix, p. 242 and preceding abstract] in a pony, recurring after surgical removal of a slightly papillomatous, tumour-like nodule on the anterior part of the septum nasi. The tissue contained sporangia in various stages of development. The infection occurred in a locality where cattle had also been attacked.

Aichelburg (U.). **Osservazioni sulle proprietà biochimiche di alcune specie di Monilie.** [Observations on the biochemical properties of some species of *Monilia*.]—*Boll. Ist. Sieroterapico Milan.*, xi, 9, pp. 577–584, 1932. [Abs. in *Bull. Inst. Pasteur*, xxxi, 11, p. 519, 1933.]

The results of the writer's studies on the biochemical properties, including action on carbohydrates, serum, gelatine, and milk, of *Monilia* [*Candida*] *krusei* [*R.A.M.*, xii, p. 371], *M. pseudotropicalis*, *M.* [*C.*] *macedoniensis*, *M. guilliermondi*, *M.* [*C.*] *pinoyi*, and *M.* [*C.*] *metalondinensis* [ibid., xi, p. 373], are stated to confirm those obtained by Castellani and his collaborators [cf. ibid., viii, p. 574]. These methods of identification may therefore be recommended as both simple and reliable, provided the strains are investigated as soon as possible after isolation.

Cerutti (P.). **Concentrazione idrogenionica e sviluppo degli ifomiceti patogeni: ricerche sperimentale e cliniche.** [Hydrogen-ion concentration and development of some pathogenic Hyphomycetes: experimental and clinical studies.]—*Pathologica*, xxv, 495, pp. 32–37, 1933. [German and English summaries.]

On Sabouraud's agar *Trichophyton gypseum* gave an alkaline reaction throughout the period of cultivation (two months), whereas

Achorion schoenleini, Sporotrichum gougeroti, and *S. schenckii* [*R.A.M.*, xii, p. 291] started with an acid reaction which slowly veered towards alkalinity.

In six cases of pityriasis versicolor [*Malassezia furfur*: ibid., xii, p. 511] a slight diminution of the acidity of the superficial cutaneous strata was observed.

Bloch (B.). **100 Jahre Dermatomykosenforschung.** [100 years of research on dermatomycosis.]—*Schweiz. Med. Wochenschr.*, lxiii, 17, pp. 404–408, 1933.

The writer traces the history of research on the dermatomycoses during the past hundred years, touching on the discoveries of Schoenlein, Audouin, Gruby, Sabouraud, and other leaders in this branch of medical science, and elaborating his own theories (based on experimental studies in collaboration with J. Jadassohn) on various problems of allergy.

Wieder (L. M.). **Modern methods in diagnosis and treatment of the common fungous diseases of the skin.**—*Wisconsin Med. Journ.*, xxxii, 4, pp. 235–241, 1933.

In this paper the writer reviews the clinical knowledge of ringworm diseases, the dissemination of which is stated to have increased rapidly in the last decade. Laboratory aids in diagnosis are given and clinical aspects of allergy and the role of *Monilia* and allied organisms in skin disorders are discussed. The large number of asymptomatic cases and carriers of ringworm is indicated by a recent investigation of 1,000 dispensary patients which disclosed pathogenic fungi in toe scrapings in 51 per cent. [*R.A.M.*, x, p. 596; xii, p. 508], of whom only 4 per cent. came in primarily for ringworm.

Burnier & Duché [J.]. **Un cas d'épidermomycose due à Trichophyton rubidum.** [A case of epidermomycosis due to *Trichophyton rubidum.*]—*Bull. Soc. Franç. de Dermatol., 1933,* **4**, pp. 379–380, 1933.

Clinical details are given of an erythemato-squamous epidermomycosis of the thighs and legs in a female patient, who contracted the disorder during a stay in the Cameroons. The fungus isolated from the squamae was characterized by a downy, white colony with a red edge and septate hyphae 3 to 4 μ in diameter, and therefore agrees with *Trichophyton rubidum* Priestley, hitherto reported only from Asia and Oceania. In an unpublished article Ota divides *T. rubrum* [*R.A.M.*, xii, p. 509] into four categories according to the mode of pigmentation, viz., red mycelium with or without diffused pigment, and white mycelium with or without diffused pigment. On this basis the fungus under observation would belong to the third of these groups. Morphologically, however, it presents the characters of an *Epidermophyton*, the spindles resembling those of *E. inguinale* [*E. floccosum*: loc. cit.], from which it differs, however, in the site of its occurrence on the body.

DEACON (G. E.). **Some effects of Botrytis cinerea on Roses.**—*Trans. Brit. Mycol. Soc.*, xvii, 4, pp. 331–333, 1 pl., 1933.

In recent years die-back in roses has increased considerably in English nurseries and private gardens. The author isolated *Botrytis cinerea* from affected wood, and inoculations resulted in the production of severe die-back in several varieties of roses, even when the plant was beginning active growth. The development of the disease appeared to be greatly influenced by the degree of humidity of the ambient air. On the removal of all infected parts and after being placed under healthy conditions, severely diseased plants recovered from the infection.

MÖHRING (K.). **Die verschiedene Widerstandsfähigkeit von Rosensorten gegen den Sternrusstau.** [The varying capacity of Rose varieties for resistance to star sooty mould.]—*Gartenwelt*, xxxvi, pp. 698–699, 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 13–16, pp. 349–350, 1933.]

Garden roses are stated to be liable to excessively heavy damage in Germany from the attacks of *Marssonina* [*Diplocarpon*] *rosae* [*R.A.M.*, xii, p. 223], especially during periods of profuse dew formation in August and September. Observations made on varieties near Mansfeld [Saxony] showed 33 to be immune, but the data obtained are not necessarily applicable to other districts, the Juliet variety, for instance, being only moderately susceptible at Mansfeld but highly so elsewhere.

PAPE (H.). **Mosaikkrankheit an Glieder-, Blatt- und Rutenkakteen.** [Mosaic disease of joint-, leaf-, and twig Cactaceae.]—*Gartenwelt*, xxxvi, pp. 707–708, 731–732, 3 figs., 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 13–16, p. 349, 1933.]

The following cactus varieties are liable in Germany to infection by mosaic manifested by the development of pale green, ill-defined, irregular, somewhat sunken spots, accompanied by dwarfing and malformation of the stem internodes: *Epiphyllum truncatum* (Deutsche Kaiserin), *E. harrisonii*, *E. hybridum rubrum*, Meteor, President Grevy, *E. rosa amabilis*, *E. salmoneum*, Vesuvius, *E. violaceum superbum*, *E. bridgesii*, *Phyllocactus gaertneri* var. *mackoyanus*, and *Rhipsalis rosea*. A virus is assumed to be the cause of the disease, which must be combated by the exclusion of infected plants from the propagating houses, and the control of possible insect vectors.

ZELLE (M. A.). Болезни Подсолнечника. [Sunflower diseases.]—*Всесоюз. Госуд. Объединение по борьбе с вредителями и болезнями в Сельском и Лесном Хоз.* [*Pan-Soviet State Assoc. Control of Pests and Diseases in Agric. and Sylvic.*], Leningrad, *Publ.* 6, 32 pp., 8 figs., 1932. [Received June, 1933.]

This is a small booklet on the principal diseases of sunflower [*Helianthus annuus*] in Russia, chiefly intended for local phytopathologists. In addition to brief descriptions of the diseases, it contains directions for recording field observations, and a few

recommendations for control. The fungal diseases dealt with are white rot (*Sclerotinia libertiana*) [*S. sclerotiorum*: *R.A.M.*, xi, p. 651], dry rot of the inflorescence (*Rhizopus nodosus*) [cf. ibid., xi, p. 282], wilt (*Verticillium dahliae*), rust (*Puccinia helianthi*) [ibid., viii, p. 791], grey mould (*Botrytis* sp.) [ibid., v, p. 701], dry brown rot of the inflorescence (*Fusarium* sp.); powdery mildew (*Erysiphe cichoracearum*) [ibid., vii, p. 621], downy mildew (*Plasmopara halstedii*) [ibid., viii, p. 579], and leaf spot (*Septoria helianthi*) [ibid., iv, p. 417]. Descriptions are also given of three serious leaf spots, the causes of which have not yet been established, namely, a brown, concentric spotting, a black spotting of various sizes and shapes, and a yellow, aucuba-like spotting; all three affections result either in a severe stunting or death of the plants affected.

Oettingen (H. v.). **Das Auftreten der Knaulgrasbakteriose in Deutschland.** [The occurrence of bacteriosis of Cock's-foot grass in Germany.]—*Mitt. Ver. Förderung der Moorkult. im Deutschen Reiche*, l, 9–10, pp. 107–108, 1932.

Attention is drawn to the serious nature of the recent epidemics of bacteriosis (*Aplanobacter rathayi*) of cock's-foot grass [*Dactylis glomerata*] in the Mark Brandenburg, Germany [*R.A.M.*, xii, p. 294]. The total annual value of the German crop of *D. glomerata* approximates to M. 1,000,000, so that systematic investigations on the disease are considered thoroughly justifiable.

Shortly after the development of the new spring growth, bare patches are noticeable in the stand, or the grass remains short and tillers irregularly if at all. The basal internodes fail to attain their full length, with the result that the floral shoots are also stunted and distortions of the leaves and leaf sheaths become apparent. About the middle of May the plants begin to show a yellow, slimy coating which is particularly conspicuous over the panicles. The flowers are united by the sticky exudate into a viscous mass of waxy consistency, bright yellow in dry weather and brownish-green under damp conditions. The slimy mass destroys all the organs with which it comes into contact, and may be so profuse as to cover the surrounding soil. Under favourable conditions the affected plants may show partial recovery, but they invariably yield diseased seed whereby the causal organism is disseminated. Stringent precautions should be taken regarding the use of clean seed, the early mowing and breaking up of infected fields, and bi- to triennial crop rotation.

Solunskaya (Mme N.). **Ueber bakterielle Erkrankung der Gefässe bei mehrjährigen Futterleguminosen als Ursache vorzeitigen Absterbens ihres Wurzelsystems.** [On a bacterial disease of the vessels in perennial fodder Leguminosae as the cause of premature dying-off of their root system.]—*Naučn. Zap. Eksper. Inst. Sacharn. Promyšl.*, ix, p. 141, 1932. (Russian.) [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 3, p. 55, 1933.]

Aplanobacter insidiosum enters the vessels of clover, lucerne, sainfoin [*Onobrychis viciaefolia*], and other legumes through frost

cracks in the epidermis, as well as in the course of mowing operations. Under Russian conditions the bacteria are most numerous in the late summer and in the younger vessels [*R.A.M.*, xii, p. 22]. The infected plants secrete a resinous substance in the vessels, leading to the obstruction of the latter. The diseased plants gradually die off, clover generally in the first year of infection and the others in the second. The sole means of combating the disease lies in the cultivation of the northern frost-resistant varieties.

Directions for spraying fruit in Illinois.—*Trans. Illinois State Hort. Soc.*, lxvi (*1932*), pp. 49–80, 2 figs., 1 map, 1933.

Spraying schedules, drawn up by the Department of Horticulture and the Natural History Survey and supplemented by explanatory notes, are given for the control of insect pests and fungous diseases of apples, pears, peaches, cherries, plums, grapes, and other fruits in Illinois. Directions are given for the preparation and mixing of sprays and dusts.

Anderson (H. W.). **Results of disease control in 1932.**—*Trans. Illinois State Hort. Soc.*, lxvi (*1932*), pp. 175–200, 6 graphs, 1933.

As in previous experiments, flotation dry wettable sulphur and flotation paste [see below, p. 577] gave equally good control of apple scab [*Venturia inaequalis*] and blotch [*Phyllosticta solitaria*] with lime-sulphur 2 in 100 [*R.A.M.*, xi, p. 520], a spray which is responsible for serious injury to the trees in some seasons. Four applications were generally given, viz., (1) pre-bloom, 14th to 15th April, (2) calyx, 5th to 10th May, (3) one week after petal fall, 12th to 14th May, and (4) three weeks after petal fall, 27th to 30th May. The best results with scab were obtained where flotation sulphur was used at the rate of 10 lb. per 100 galls. water at all four applications, but since the outcome was almost equally satisfactory with 7 lb. at the calyx and 5 lb. at each of the subsequent sprays, the latter concentrations may be recommended. A full bloom spray of 5 in 100 was found to be of considerable value in the reduction of foliage infection in cool, wet weather, when the calyx application may be delayed. Satisfactory early blotch control was obtained where the concentration was maintained at 10 lb. per 100 galls. through the three weeks applications.

In a lime-lead arsenate combination the latter appears to be the chief fungicidal agent. All plots which received lime-sulphur showed from moderate to severe injury whereas those receiving flotation sulphur were completely uninjured or in a few cases very lightly damaged [ibid., xii, p. 29]. During the five years in which detailed investigations (now to be discontinued) of the latter product have been made by the writer in Illinois, both the paste and the dry wettable flotation sulphur have undergone a steady improvement as regards physical properties and uniformity. The dry wettable sulphur (10–7–5–5 lb. applications, respectively) costs 10 to 15 cents. per tree per season more than lime-sulphur, but as a rule this extra outlay will, in the writer's opinion, be sufficiently remunerative to justify it. Among the diseases amenable to con-

trol by flotation sulphur, besides apple scab and blotch, are cherry leaf spot [*Coccomyces hiemalis*], gooseberry anthracnose [*Pseudopeziza ribis*], rose mildew [*Sphaerotheca pannosa*] and black spot [*Diplocarpon rosae*], peach brown rot [*Sclerotinia americana*], and peach scab [*Cladosporium carpophilum*].

Das Gupta (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. IV. On the pathogenicity of certain strains of Phomopsis and Diaporthe.**—*Ann. of Botany*, xlvii, 186, pp. 385–400, 5 diags., 1933.

The results [given largely in the form of tables and graphs] of continued studies of the relative attacking power on apples of the species of *Diaporthe* and *Phomopsis* enumerated in a previous communication [*R.A.M.*, ix, p. 658], together with a few others, showed that none of the fungi tested differed significantly in its activity from the *Cytosporina ludibunda* saltants [ibid., xii, p. 377] in both Bramley's Seedling and Worcester Pearmain apples. While the strains of *D. perniciosa* exhibited wide variations in their rate of invasion (more pronounced in Bramley's Seedling than in Worcester Pearmain), the series tended to run parallel to the variations found in *C. ludibunda*, and while in Worcester Pearmains the invasion value for *P. coneglanensis* (0·1143 cm. per day) was higher than that (0·0860) for the CA_4 saltant of *C. ludibunda*, the most active of the saltants, the difference was shown to be statistically non-significant.

Attempts to arrange the strains of the fungi in groups were somewhat unsatisfactory, inasmuch as while certain forms, e.g., *D. binoculata* and *D. arctii*, were consistently either medium or weak, and *P. coneglanensis* was always very active, the remainder varied greatly in rate of attack from variety to variety; the age of the apples also appeared to affect the rate of invasion of the individual strains.

From the results obtained the author concludes that *C. ludibunda* cannot be distinguished from the species of *Phomopsis* and *Diaporthe* studied by its power of attack on apples, this similarity between the organisms agreeing with that observed in earlier cultural work with these fungi [ibid., ix, p. 547].

Tiller (L. W.) & Chittenden (E.). **Relation of storage temperature to the overseas carriage of some further varieties of New Zealand export Apples. Report on special work undertaken by the Cawthron Institute, 1930 and 1931.**—*New Zealand Journ. of Sci. & Techn.*, xiv, 4, pp. 241–251; 5, pp. 288–297, 1933.

In continuation of previous investigations on the optimum storage temperature for certain New Zealand export apple varieties [*R.A.M.*, ix, p. 462], the writers during 1930–1 made further similar observations on seven varieties, each of which is separately discussed in relation to the particular types of wastage affecting it.

Cox's Orange Pippin grown on a fertile light loam was found to be superior in storage quality to that grown on a clay-loam deficient in nutriment, in respect both of internal breakdown and bitter pit. Owing to its susceptibility to the former disease this

variety should not be carried at a temperature below 38° F. [cf. ibid., viii, p. 252]. Less bitter pit occurs in Cox's Orange Pippin at 32° than at 38°, but carriage at the former temperature cannot be recommended on account of the great severity of internal breakdown, followed by heavy losses from fungal decay, under these conditions. Earlier pickings of Cox's Orange Pippin tend to show more bitter pit than later ones.

Jonathans should be carried at a temperature above 35°, at or below which internal breakdown and deep scald are liable to develop, the latter disease continuing to increase slightly in the fruit after its removal from two months of storage. Deep scald seemed to be most prevalent in mid-season fruit; it does not necessarily appear first on the surface of the apple, but may start $\frac{1}{8}$ to $\frac{1}{4}$ in. below. Jonathan spot may be controlled by the avoidance of unduly late picking.

The Rome Beauty, Granny Smith, Cleopatra, and Worcester Pearmain varieties also kept best at 35°, 32° coming next in order of preference for the first-named. This variety should be picked early to avoid the risk of internal breakdown and of fungal infection on removal from storage. Granny Smith proved to be tolerant of a wide temperature range and both in this variety and in Cleopatra internal breakdown was restricted to the core. Worcester Pearmains are liable to a certain amount of internal breakdown at 32° while at 38° maturity is unduly accelerated, but on the whole the wastage in this variety, even among the very late pickings, was found to be remarkably small. The Dougherty variety also seems to be most accommodating as regards storage requirements, keeping well at 32°, 35°, and 38°, though somewhat insipid in flavour at the lowest temperature.

HEALD (F. D.) & BAKER (K. F.). **Some new observations concerning blue mold decay of Apples.**—*Proc. Washington State Hort. Soc.*, xxviii, pp. 164–174, 1932. [Received June, 1933.]

The information in this paper concerning the mode of infection and control of blue mould (*Penicillium expansum*) of apples in Washington has already been noticed from another source [*R.A.M.*, xii, p. 226].

Black end of Pears.—*Fruit World of Australasia*, xxxiv, 4, p. 209, 1933.

An apparently physiological condition referred to as 'black end' [cf. *R.A.M.*, xii, p. 103] and affecting William, Packham, Bosc, Laurence, and Clairgeau pear fruits in the Diamond Creek district of Victoria was first observed some five or six years ago, since when it has steadily become more prevalent. The disease appears at the calyx as a faint russet mark which turns black and extends to form a ring round the eye, sometimes spreading half-way down the side of the fruit, which may crack. The injury is superficial but the fruit becomes woody and unpalatable.

Black end appears as soon as the fruit is ready for picking and it may develop during storage. Once a tree becomes affected the trouble is said to recur each year, though, apart from the fruit, growth remains normal.

SCHILBERSZKY (K.). **Über die Ursachen der Apoplexie bei den Steinobstbäumen. II.** [On the causes of apoplexy in stone fruit trees. II.]—*Angew. Bot.*, xv, 2, pp. 106–122, 1933.

Further investigations on the factors affecting the occurrence of apoplexy or gummosis in stone fruit trees in Hungary and elsewhere [*R.A.M.*, xii, p. 227] are reported in this paper. Wounding, faulty methods of grafting, the use of incompatible stocks, and parasitic infection all play their part in the development of gummosis. Among the fungi most prominently concerned in gum formation are *Clasterosporium carpophilum* and *Sclerotinia cinerea* [ibid., xii, pp. 301, 302]. It was formerly believed that the conidial (*Cytospora*) stages of various species of *Valsa* were implicated in the causation of gummosis [ibid., xi, p. 60], but this view is refuted by the experiments of the writer and others, showing that these fungi can only attack trees already weakened or killed by adverse conditions. Many of the apoplectic trees examined by the writer during his extensive investigations showed no trace of fungi.

Control measures should include protection against the effects of frost, the application of lime to the soil where necessary, care to avoid superfluous wounding of the roots and crown, drainage, a plentiful water supply during dry periods, and prophylactic treatment against the spread of fungous infections.

SVOLBA (F.). **Russtau an Prunus domestica.** [Sooty mould on *Prunus domestica.*]—*Gartenbauwissensch.*, vii, pp. 282–292, 8 figs., 1932. [Abs. in *Neuheiten auf dem Geb. des Pflanzensch.*, xxvi, 3, p. 56, 1933.]

In the Kamp valley (Lower Austria) the sooty mould covering all the organs of plum trees infested by the scale insect *Eulecanium corni* was found to consist almost exclusively of *Dematium* [*Pullularia*] *pullulans* [*R.A.M.*, iii, p. 556; iv, p. 60], with the occasional participation of *Cladosporium herbarum*, *Stemphylium* sp., various moulds with a reddish-brown or white mycelium, and the pink yeast, *Torulopsis* sp. [ibid., xi, p. 642]. Heavy damage is caused by the joint effects of the insect and sooty mould.

ANDERSON (F. G.). **The phony Peach disease in Illinois.**—*Trans. Illinois State Hort. Soc.*, lxvi (*1932*), pp. 214–217, 1933.

Since 1927 the phony disease of peaches [see next abstract] has been found in eight counties in Illinois, most of the affected trees being 7 to 15 years old when the initial symptoms were detected. The source of infection cannot be definitely traced. The disease is briefly described in popular terms and growers are urged to make every effort to eradicate it from the State.

BRYANT (M. W.). **Report on the conference on the phoney Peach disease held at Memphis, Tennessee, on December 13, 1932.**—*Trans. Illinois State Hort. Soc.*, lxvi (*1932*), pp. 217–226, 1933.

At a conference on the phony peach disease held at Memphis, Tennessee, on 13th December, 1932, objections were raised to the

extension of the quarantine restrictions to Illinois and other States on the grounds (1) that the disease in question is readily controllable by the eradication and destruction of infected trees, and (2) that it is not transmissible by propagation. [These restrictions have since been removed: *R.A.M.*, xii, p. 528.]

Benton (R. J.) & Barnett (G. B.). **To control brown spot of Passion fruit.**—*Agric. Gaz. New South Wales*, xliv, 4, pp. 317–318, 1933.

This is a brief account of spraying experiments in 1932–33 at the Grafton Experiment Farm, the results of which showed that monthly applications from August to mid-January of 6–4–50 Bordeaux mixture gave excellent control of brown spot [*Macrosporium* sp.: *R.A.M.*, xii, p. 41] of passion fruit [*Passiflora edulis*], while in the unsprayed rows practically all the foliage had become diseased and 50 per cent. of the fruit was destroyed. It was noticed that the fruit on the sprayed plants matured almost two weeks earlier than that on the controls.

Martin (H.) & Salmon (E. S.). **The fungicidal properties of certain spray-fluids. X. Glyceride oils.**—*Journ. Agric. Sci.*, xxiii, 2, pp. 228–251, 2 figs., 1933.

In the tenth paper of this series [*R.A.M.*, xi, p. 731] the authors give a full report of their study of the fungicidal action on the conidial stage of *Sphaerotheca humuli* of various glyceride oils of vegetable and animal origin [ibid., xi, pp. 253, 464]. All the oils tested, with the exception of castor oil, when emulsified with 0·25 per cent. agral I [ibid., xii, p. 403], proved to be fungicidal at concentrations of 0·5 to 1 per cent., this property being associated with the glyceride structure of the oils, as indicated by the fact that it was destroyed by saponification. There was also evidence that toxicity was not affected by the presence in the oils, when applied with dilute solutions of agral I, of those impurities which are removable by refinement. Of the two components of the glycerides, glycerol and fatty acid, the former was shown not to be completely fungicidal and to cause leaf injury at 4 per cent., while the second, at 1 per cent., was phytocidal [i.e., lethal to the host tissues]. Triolein, prepared by synthesis from glycerol and oleic acid, was fungicidal at 0·5 per cent., and did not injure the hop leaves.

The type of emulsification used was shown to exert a considerable influence on the fungicidal properties of the glyceride oils. Stable emulsions produced by the two-solution method (in which the free fatty acid content of the oil is increased by the addition of oleic acid, the mixture being added to a suitable dilution of sodium hydroxide) were less effective than unstable emulsions obtained by agitation with dilute agral I solutions. Finally, it was found that emulsifiers alkaline in reaction or which require the addition of alkali are unsuitable for the preparation of sprays containing glyceride oils. Bordeaux mixture, on the other hand, proved to be suitable for this purpose [ibid., xi, p. 464].

Sauchelli (V.). **Flotation sulfur in agriculture.**—*Indus. & Engin. Chem.*, xxv, 4, pp. 363–367, 4 figs., 1 graph, 1933.

Flotation sulphur [*R.A.M.*, ix, p. 796, and above, p. 572] is derived from bituminous coal by the so-called liquid purification process (devised by the Koppers Company) [Pittsburg], which is based on the absorption of hydrogen sulphide in an alkaline solution. Subsequently, in the presence of a suitable catalyst, the hydrogen sulphide is broken down to yield elemental sulphur, which is recovered by a flotation process in the shape of extremely fine particles approaching colloidal dimensions (average 3 μ) and prepared for the market in three forms: a wet paste, a dry, wettable dust, and a dry dust.

Since 1927 investigations on the efficacy of flotation sulphur in disease control have been conducted in all the important agricultural districts of the United States and Canada by the Crop Protection Institute, which is maintained by the Koppers Research Corporation. A tabulated account is given of these experiments, showing the value of the flotation sulphur preparations in the control of a number of well-known plant diseases.

Görnitz (K.), Trappmann (W.), Nitsche (G.), & Voelkel (H.). **Methoden zur Prüfung von Pflanzenschutzmitteln. Beiträge IV–VI.** [Methods of testing plant protectives. Contributions IV–VI.]—*Mitt. Biol. Reichsanst. für Land- und Forstwirtsch.*, 46, 94 pp., 15 figs., 2 diags., 12 graphs, 1933.

Under the general heading of new apparatus and methods [cf. *R.A.M.*, v, p. 566], the first-named author describes a special contrivance for determining the dosage of spray or dust materials deposited on the leaf surface during treatment; explains the mode of testing plant protectives for their resistance to washing off by rain; and discusses the maintenance of permanent cultures of *Plasmopara viticola* for the inoculation of vine leaves on which to test the efficacy of new fungicides. The remainder of this section and the other contributions deal with subjects of entomological interest.

Marsais (P.). **Pulvérisateurs et poudreuses modernes.** [Modern spraying and dusting apparatus.]—*Rev. de Vitic.*, lxxviii, 2023, pp. 223–226, 1 fig., 1933.

In this paper the author gives notes on, and some constructional details of, two new horse-driven machines (a sprayer and a duster) which are constructed by the Castaing works in Bordeaux, and of which Messrs. F. Béraud-Sudreau & Cie, 86, Rue Jules-Ferry, Caudéran-Bordeaux, are the concessionnaires. These machines are claimed to mark a considerable advance on those that are at present in general use.

Pflanzenschutz in der U.d.S.S.R. [Plant protection in the U.S.S.R.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, xiii, 4, pp. 27–29, 1 map, 1933.

The aim of the Pan-Russian Institute for Plant Protection is the organization of all scientific work in the realm of plant protection in the U.S.S.R., including independent researches on the

most important phytopathological problems affecting the country; the perfecting of research methods; studies of the laws governing the periodical mass multiplication of pests and diseases; the investigation of control measures; and the education of highly qualified experts in plant protection. The last-named object is pursued at the educational institute for plant protection experts at Vladimir, whilst the headquarters of the Institute are at Leningrad and there are ten branches in different parts of the Republics. The departments of the Institute include general phytopathology, diseases and pests of forest trees, plant protection technique propaganda, and the supervision of imports and exports for pests and diseases.

LAUBERT (R.). **Über die Zunahme verheerender Pflanzenkrankheiten.** [On the increase of devastating plant diseases.]—*Gartenbauwirtsch., 1932*, 4, pp. 1–2, 1932. [Abs. in *Zentralbl. für Bakt.*, Ab. 2, lxxxviii, 8–12, pp. 267–268, 1933.]

A list is given of destructive fungous and bacterial parasites of horticultural plants (fruit, vegetables, and ornamentals) introduced into Germany within the last 100 years. Fifteen of the pathogens under discussion have only been known in the country since the beginning of the present century, the period from 1907–9 being marked by a particularly heavy invasion; they are *Cladosporium fulvum* [on tomato], *Corynespora* [*Cercospora*] *melonis* [on cucumber: ***R.A.M.***, vii, p. 6 *et passim*], *Exobasidium japonicum* and *Septoria azaleae* [on *Rhododendron* spp.: ibid., x, p. 734], *Oidium euonymi-japonicae* [on *Euonymus japonicus*: ibid., viii, p. 579], *Microsphaera quercina* [on oak: ibid., xi, p. 682], *Sphaerotheca mors-uvae* [on gooseberry], *Uropyxis sanguinea* [*Puccinia mirabilissima*: on *Berberis aquifolium*: ibid., xii, p. 375], *Oidium hortensiae* [on hydrangea: ibid., xii, p. 175], bacterial tumours [*Bacterium tumefaciens*] on chrysanthemum [ibid., xi, p. 785], *Pseudoperonospora humuli* [on hops: ibid., x, p. 621], *P. cubensis* [on cucumber: ibid., vii, p. 7], *Synchytrium endobioticum* [on potato], *Graphium* [*Ceratostomella*] *ulmi* [on elm: ibid., xi, p. 275], and *Rhabdocline pseudotsugae* [on *Pseudotsuga taxifolia*: ibid., xii, p. 257].

KUHNHOLTZ-LORDAT (G.). **Les foyers permanents.** [Permanent foci.]—*Rev. Path. Vég. et Ent. Agric.*, xx, 3, pp. 118–127, 1 pl., 2 figs., 1933.

The author believes that a fuller understanding of the causes that bring about outbreaks of economically important plant diseases may be obtained by a study of the behaviour of related fungal diseases of wild plants. As an illustration of this he points out the striking parallel observed by him between the incidence of various downy mildews (*Peronospora* spp.) of weeds and that of the vine (*Plasmopara viticola*) in the Hérault in 1932, the former of which are endemic in the region. Furthermore, he gives his observations on an outbreak in 1932, after many years of quiescence, of *Armillariella* [*Armillaria*] *mellea* on different species of trees in the Mandon Park near Montpellier, probably due to the very wet conditions of that year. The spread of the fungus was traced

to two permanent foci of long standing in the park, from which infection is believed to have occurred through spores carried by running water or by floods, rather than through the air.

Bisby (G. R.). **The distribution of fungi as compared with that of phanerogams.**—*Amer. Journ. of Botany*, xx, 4, pp. 246–254, 1933.

From his studies on the distribution of the Uredinales, and of the fungi of Manitoba and India [*R.A.M.*, ix, p. 344; xi, pp. 545, 546], and from a survey of the contemporary literature on the relative predominance of phanerogams and fungi, the author concludes that the total number of species on the earth is evidently of the same order in both groups, although in the present state of knowledge the records of the former outnumber the latter by about two to one. Notwithstanding the smaller total number of species of fungi known, more fungi than flowering plants have been reported from various States and Provinces of North America which have been intensively surveyed (over twice as many, for instance, in Manitoba), and a similar ratio exists in certain European countries. In subtropical or tropical areas, such as India, the number of recorded spermatophytes greatly exceeds that of the fungi, but in those parts of the world the latter have been very inadequately studied. In general, it may be taken as established that the smaller the area surveyed, the greater is the excess of fungi over the flowering plants, with which they are predominantly associated, while in larger areas the totals approximate more closely.

The average distribution or range of species of fungi is more extensive than that of the phanerogams. Generally speaking, saprophytes (such as Myxomycetes, Mucorales, Pezizales, and Gasteromycetes), which are not commonly specific to their substrata, are more widely distributed than parasites. Even such obligate parasites as the rusts, however, are frequently more widespread than their individual hosts owing to their capacity for attacking more than one species.

It is clear from the evidence available that fungi commonly have a wide distribution over the earth, the chief limiting factor in their occurrence being the presence of appropriate hosts or substrata, while climatic conditions are apparently of lesser importance, though undoubtedly playing a part in the distribution of many species.

Dickinson (S.). **The technique of isolation in microbiology.**—*Phytopath.*, xxiii, 4, pp. 357–367, 3 diags., 1933.

The writer reviews the various methods of single cell isolation which have been published, under three heads: (1) in which the cells are separated by chance, usually in a volume of liquid, e.g., the dilution and pipette methods; (2) the cells are separated by design when lying in one plane, e.g., the dry needle and Dickinson methods [*R.A.M.*, v, p. 377], and (3) the cells are separated by force, e.g., the microscissors method.

The last-named method is based on a suggestion made by E. C. Stakman and consists in cutting the hyphae in two with a pair of

microscissors attached to a micromanipulator or isolator. The blades of the scissors are made of small pieces of an ordinary razor blade, very sharply pointed, and mounted at the ends of circular steel rods so as to meet the agar culture surface perpendicularly. One of the blades moves by a rack-and-pinion movement past the other, parallel to the microscope stage, the blades being so adjusted that their tips are on the same level and come into contact only when the movable blade passes the stationary one. Generally speaking, this method is applicable only to hyphae growing on the surface of the agar. In practice, the material is placed or grown on agar drops on cover-slips similar to those used in the isolation of small separate cells. Having completed the separation of the required cell by cutting those on either side of it, isolation may be effected by the use of the Dickinson isolator.

The following simple method of single cell isolation is described by the author. The material from which spores are to be isolated is placed on an agar drop on a cover-slip, inverted over a hole cut in a microscope slide. The latter is placed on the mechanical stage of the microscope with the hole directly over the condenser, on top of which is a cover-slip bearing an L-shaped glass rod, with its vertical arm tapering to a fine point and fastened to the cover-slip by plasticine. The tapered tip of the glass rod is raised or lowered by means of the condenser rack-and-pinion movement, while the actual handling of the spores is done by the dry needle or Dickinson method.

VOLKONSKY (M.). **Procédé rapide et simple de purification des cultures de champignons oomycètes.** [A rapid and simple method for the purification of cultures of oomycetous fungi.] —*Comptes rendus Soc. de Biol.*, cxii, 16, pp. 1657–1658, 1933.

The following method has been found both simple and efficacious in the purification from contamination of oomycetous fungi in general and of *Phytophthora* spp. in particular. The slowly growing creeping mycelium, contaminated by bacteria, is placed on a fragment of nutrient medium at the bottom of a Petri dish and covered by a lid into which a layer of agar has been poured; the dish is then inverted. Under these conditions the aerial mycelium develops rapidly, reaching the agar on the lid in four to ten days when the hyphae connecting the lid with the dish can be broken. A dilute Sabouraud's medium and soy-bean or malt agar are suitable for this method of purification.

GHIMPU (V.). **Sur les maladies à virus de quelques Solanées.** [On the virus diseases of some Solanaceae.]—*Comptes rendus Soc. de Biol.*, cxii, 11, pp. 1113–1115, 1933.

The following virus diseases have been observed in Rumania: mosaic of tobacco, *Petunia violacea*, tomato, potato, and various wild Solanaceae; ring spot of tobacco (also observed on *Nicotiana affinis*, *N. quadrivalvis*, *N. viscosa*, and the hybrid *N. tabacum* × *N. glauca*); and veinbanding and spot necrosis of tobacco [*R.A.M.*, xi, p. 607]. These diseases scarcely ever occur in the greenhouse and seed-beds, indicating that the seed is not, in general, respon-

sible for the transmission of the virus. Some wild plants and the débris of annuals affected by virus diseases maintain their virulence for lengthy periods under unfavourable conditions. Thus, tobacco stems and roots kept for six months on a stove at a temperature of 50° to 60° C. were found to be capable of producing the typical mosaic symptoms in healthy seedlings 10 to 15 days after inoculation by rubbing.

The inoculation of growing tobacco plants by the mosaic virus resulted in a number of foliar and floral malformations in addition to the usual symptoms, e.g., twisting of the flowers, splitting of the petals, sepals, and stamens, synanthia, staminodia, tri- and quadrilobate stigmas, supernumerary petals and pollen sacs, and various other forms of atrophy, hypertrophy, or metamorphosis. The following modifications were observed in the cells of diseased tobacco leaves: fragmentation of the vacuome, abundant formation of calcium oxalate crystals in the vacuolar juice, degeneration of the chloroplasts, excessive hydrolysis of starch, and the formation of proteid crystals and of X-bodies.

A marked improvement in the condition of mosaic tobacco plants was effected by the application of nitrogen or compost to the soil. *P. violacea* plants lost all trace of mottling after 30 days under bell jars at a temperature fluctuating between 20° and 45°.

Mosaic was found not to be transmissible from *P. violacea* to tobacco and vice versa, or from tobacco to *Soja hispida* and vice versa. *N. tabacum* grafted on *N. glauca* did not contract mosaic on inoculation of the stock, showing that the virus is incapable of attacking or even passively traversing the latter species.

Salaman (R. N.). **Protective inoculation against a plant virus.** —*Nature*, cxxxi, 3309, p. 468, 1933.

In a recent series of experiments at the Potato Virus Research Station, Cambridge, the writer inoculated by needle healthy White Burley tobacco seedlings from both the green and yellow areas of a fairly severely virus *x*-infected leaf of the same variety [*R.A.M.*, xi, p. 594]. Two distinct clinical conditions developed as a result of this operation, viz., an extremely mild disturbance when inoculum from the green areas was used, designated as the *G* type of *x*, and a very severe disease from the yellow areas, characterized by large, bright yellow patches on a pale green background, and by dwarfing (the *L* type of *x*). By mixing the *G* and *L* tissue extracts in varying proportions *in vitro* and inoculating them into tobacco seedlings, it was shown that a mixture of 1 *L* : 9 *G* produces a preponderantly *G* reaction, whereas blends with less of the *G* element evoke a reaction similar to that of *L*. Subcultures from the mixed yellow and green areas thus produced yield the original *L* and *G* types, showing that the two strains do actually mix and are not neutralized the one by the other.

When tobacco plants inoculated with the mildest type of the *G* form of the *x* virus are reinoculated nine days later either with the *L* strain or with the most necrotic type of *x*, no further reaction ensues, the test plants retaining their barely perceptible *G* type of reaction and presenting complete immunity from any

further attacks of the *x* virus. It was subsequently shown that this protection against the virulent *x* strains is developed on the fifth day after the preliminary inoculation, and some four to five days before any systemic response to *G* is apparent. Subcultures from such doubly inoculated plants yield only the *G* type of the *x* virus, indicating that once the plant cell has formed a symbiotic union with the non-virulent strain it is incapable of entering into further relations with any other virus elements of the same generic type [cf. ibid., xi, p. 751].

In *Datura stramonium* both the *L* and the necrotic forms of *x* produce fatal effects, which may be obviated, however, by a preliminary dose of the *G* strain of *x*. The latter also affords protection against Hy (*Hyoscyamus*) IV [ibid., xii, p. 243], but is powerless against K. M. Smith's *y* potato virus [ibid., xii, p. 42] and Johnson's No. 1 common tobacco mosaic [ibid., xii, pp. 314, 398].

No evidence of a mild or symptomless *G* form, or of any protective mechanism, has yet been found in the green 'veinbanding' islets, a late development of tobacco leaves infected by the *y* virus.

ALDRICH-BLAKE (R. N.). **On the fixation of atmospheric nitrogen by bacteria living symbiotically in root nodules of Casuarina equisetifolia.**—*Oxford Forestry Mem.* 14, 20 pp., 2 pl., 1 fig., 1 graph, 1932.

Investigations on the fixation of atmospheric nitrogen by the bacteria occurring as symbionts in the root nodules of *Casuarina equisetifolia* [*R.A.M.*, xi, p. 797] were initiated by the writer at the Forest Research Institute, Dehra Dun, United Provinces, India, in April, 1930, and continued after his return to England by his colleagues H. G. Champion and M. V. Laurie, the seedlings being sent to Oxford for examination.

The plants were grown under strictly controlled conditions in pots in sieved and washed grey sand from a river-bed with a nitrogen content of 0·003 per cent., to which appropriate quantities of pure chemical nutrients were added. The inoculum consisted of thin slices of bacterial nodules (10 gm. per pot) from Bombay, introduced into four holes round each seedling. Each control pot was similarly inoculated with sterilized material. About fifteen months after inoculation the infected plants presented a very sturdy appearance. The stems and main branches were thick and woody, with dark green shoots, in contrast to the yellowish-green of the controls and to the reddish-yellow of another series receiving ammonium nitrate. The roots of the inoculated plants completely filled the pots with an interwoven mass and bore nodules up to 3·8 cm. in diameter, whereas none were found on the controls. The inoculated seedlings reached a mean height of nearly 55 in., the corresponding figures for the controls and for the series treated with ammonium nitrate being about 16·5 and 26, respectively. The aggregate dry weight of the inoculated roots was 133·50 $\pm$ 5·94 gm. per pot, compared with 9·28 $\pm$ 1·66 and 33·83 $\pm$ 1·39 gm. for the controls and ammonium nitrate series, respectively. The nitrogen content of the inoculated roots (per cent. of dry weight)

was 1·31 ± 0·08, compared with 0·96 ± 0·02 and 0·77 ± 0·63 for the controls and ammonium nitrate series, respectively.

The results of these experiments are considered to prove that *C. equisetifolia* is among the increasing number of plants now known to obtain atmospheric nitrogen through bacteria symbiotic in their roots or leaves. Bacterial nodules are also present on the roots of five other species of *Casuarina*, viz., *C. muricata*, *C. quadrivalvis*, *C. stricta*, *C. glauca*, and *C. cunninghamiana*, and the use of trees of this genus as hosts for the valuable sandalwood tree [*Santalum album*] is recommended.

Magrou (J.) & Magrou (Mme M.). **Sur les variations d'activité des Rhizoctones d'Orchidées.** [On the variations of activity in the *Rhizoctonia* spp. of the Orchidaceae.]—*Ann. Sci. Nat., Bot.*, Sér. X, xv, 1, pp. 303–305, 1933.

In an attempt to reactivate a fairly old isolation of *Rhizoctonia repens* [*R.A.M.*, xi, p. 388] which had lost the ability to induce germination in *Cattleya* seeds the authors made sowings of this host on salep agar in seven tubes, two of which acted as controls, while three were inoculated with a culture eight months and twelve days old (mycelium C) and five others with one ten months old (mycelium C′). The two controls failed to show any growth, a slight growth appeared in one tube inoculated with mycelium C, and leaf-bearing seedlings developed in two of the tubes inoculated with mycelium C′. After about four and a half months, mycelium (C_1') was isolated from one of the seedlings obtained from inoculation with mycelium C′ and was used to inoculate seven sowings of *Cattleya*. These gave 18 germinations in all, representing an average of 2·57 germinations per tube. Three sowings inoculated with mycelium C′ which had been kept in culture for fifteen months gave an average of 1·33 germinations per tube.

The activity of the mycelium C′ was thus doubled by a four and a half months' association with the *Cattleya* seedling.

Eftimiu (Panca). **Sur la présence d'un champignon chez Bucegia romanica Radian.** [On the presence of a fungus in *Bucegia romanica* Radian.]—*Comptes rendus Acad. des Sciences*, cxcvi, 13, pp. 957–959, 1933.

Bucegia romanica is a somewhat uncommon representative of the Marchantiaceae in the Carpathian mountains of Rumania, where it occurs in close association with *Preissia commutata* and *Fimbriaria lindenbergiana*, between which it may, in fact, be a hybrid. An anatomical study of the liverwort revealed the presence, in the thalli bearing the female inflorescences, of an endophytic fungus with septate, vacuolate hyphae [cf. *R.A.M.*, xii, p. 235]. Hitherto only a sharply defined zone of the chlorophyll tissue has been found to show infection, but there is reason to believe that the plant is penetrated by way of the rhizoids. The nuclei of the infected cells degenerate, the cytoplasm disappears, and the slightly hypertrophied cellular cavity becomes filled with hyphae. The fungus further appears to act on the neighbouring cells, which gradually lose their staining capacity.

MATSUURA (I.). **Experimental studies on the saltation in fungi. VI. (Preliminary report.) On the saltation in the genus Brachysporium.**—*Journ. Plant. Protect.*, xix, pp. 121–139, 1 pl., 1 fig., 1932. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 3, p. (75), 1933.]

Saltation to a white mycelium was observed in the writer's cultures of the strains of *Brachysporium* parasitic on *Cynodon dactylon*, *Setaria italica*, red pepper [*Capsicum annuum*], and *Cyperus iria* in Japan [*R.A.M.*, x, p. 541]. As a rule the white patches produced along with the normal black mycelium persisted through several generations in monospore cultures, but a few cases of partial or total reversion to the original type were noticed. The pathogenicity of the saltant from *Cynodon dactylon* was found to be stronger towards its original host and weaker towards rice than in the case of the parent. The frequency of saltation was not increased by irradiation.

MATSUURA (I.). **Experimental studies on the saltation in fungi. VII. (Preliminary report.) On the mechanism of the occurrence of 'island' type of saltation.**—*Journ. Plant Protect.*, xix, pp. 409–428, 1 pl., 1932. (Japanese.) [Abs. in *Japanese Journ. of Botany*, vi, 3, pp. (75)–(76), 1933.]

Two- to three-day-old cultures of *Helminthosporium* sp. were observed to show a sinking of the aerial strands of hyphae due to the production from the under surface of a liquid secretion. This process, termed 'pseudomyceliose', results in a weakening and attenuation of the hyphae involved. It was noticed in association with the formation of 'island-like' saltants, and the liquid is believed to contain some metabolic product to the action of which the saltation is attributed.

CAMPANILE (SILVIA). **Composizione chimica delle spore di parassiti vegetali di cereali.** [The chemical composition of the spores of vegetable parasites of cereals.]—*Nuovi Ann. Agric.*, xii, 4, pp. 640–648, 1932. [Received April, 1933.]

Analysis of the ash of the spores of *Ustilago avenae*, *U. hordei*, *U. tritici*, and *U. maydis* [*U. zeae*] showed them to contain, respectively, 32·23, 15·3, 8·12, and 9·2 parts of silica, 29·1, 48·65, 52·2, and 52·4 parts of potassium oxide, 17·6, 25·2, 25·47, and 18·5 parts of phosphorus pentoxide, 8·19, 4·83, 5·13, and 4·35 parts of calcium oxide, and 2·84, 3·05, 3·9, and 2 per cent. of nitrogenous material. The corresponding figures (obtained from an examination of the literature of the subject) for the seeds of the respective hosts, oats, barley, wheat and maize were 39·18, 25·91, 1·96, and 2·09 parts of silica, 17·9, 20·92, 31·16, and 29·78 parts of potassium oxide, 25·64, 35·1, 47·22, and 45·61 parts of phosphorus pentoxide, and 3·6, 2·64, 3·25, and 2·17 parts of calcium oxide.

These figures are considered to show that a parallel may be established between the chemical composition of cereal seeds and that of the spores of the fungi which attack them; the parasitism of the cereal smuts may be conditioned to some extent by alimentary needs, the specific nature of the attack on a particular host being partly due to the alimentary possibilities of that host. Attention

is drawn to the large nitrogen, phosphorus, and potash content of the spores, and to the fact that whereas in the seeds phosphorus pentoxide predominated over potash, in the spores the reverse was the case. It is thought that the large potash content present in the spores of the cereal smuts may account for their tendency to induce cellular multiplication and the virulence shown by the promycelium towards growing tissues.

The large quantities of nitrogen, potash, and phosphorus taken up by the fungus to form spores are removed from the host at or about flowering time, when they are present in the inflorescences in the largest amounts, so that the fructification of the smuts of barley, oats, and wheat (but not maize, as *U. zeae* is able to fructify on the vegetative organs) at the same time and in the same place as that of the host can be considered to depend on alimentary requirements. Preliminary examination of the uredospores of wheat rusts [*Puccinia* spp.] showed that although these develop on other parts than the floral organs they also contained high percentages of phosphorus pentoxide and potash. Hence spore formation on Gramineae attacked by smuts or rusts must very seriously weaken the plant, while the removal of substances necessary for seed formation explains the reduced fructification on the part of the host observed in cereal rusts.

The spores of *Tilletia caries* were found to contain 38·7 per cent. phosphorus pentoxide and 36·19 per cent. potassium oxide. When wheat caryopses were completely invaded by this fungus it was found that the latter had used up the potash and phosphorus elaborated by the host for seed formation.

VERPLANCKE (G.). **Étude comparative de Pommes de terre d'origines diverses. II. Résultats des expériences faites en 1932.** [A comparative study of Potatoes of various origins. II. Results of experiments made in 1932.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, ii, 1, pp. 45–73, 1 graph, 1933. [Flemish, German, and English summaries.]

In further tests of the value of seed potatoes from Holland and the Ardennes [*R.A.M.*, xi, p. 800], tubers of the Industrie variety grown for one year in various localities in Belgium were planted in 1932 in four districts, comparisons also being made with fresh seed of the same variety.

The results obtained [which are tabulated, expressed graphically, and fully discussed] showed that the degeneration diseases present were leaf roll, mottling, mild mosaic, rugose mosaic, crinkle mosaic, aucuba mosaic, and streak. Cultivation for one year in each locality produced an increase in the percentage of leaf roll, the incidence of which amounted to 2 to 4 per cent., 4 to 9 per cent., 6 to 25 per cent., and 59 to 79 per cent. after cultivation at Gembloux, in the Campine, at St. Hubert, and at Ruysselede, respectively. In general, mottling and mild mosaic, the other chief virus diseases, were less prevalent in 1932 than in 1931. In the Belgian Ardennes potato fields apparently quite free from virus diseases were found adjacent to others where over 75 per cent. of the plants were affected.

Taken as a whole, the results (as in the previous year) showed

that the certificated Dutch Industrie potatoes were superior both as regards freedom from virus diseases and yielding capacity to those from the Ardennes.

Köhler (E.). **Untersuchungen über die Viruskrankheiten der Kartoffel. I. Versuche mit Viren aus der Mosaikgruppe.** [Investigations on the virus diseases of the Potato. I. Experiments with viruses of the mosaic group.]—*Phytopath. Zeitschr.*, v, 6, pp. 567–591, 15 figs., 1933.

A detailed account is given of the writer's studies on the nature of five viruses isolated from potatoes in Germany and herein designated M23, M29, H19, R77, and G.A. Of these M23 and M29 were derived from plants of the Kl. Spiegeler Wohltmann variety received from Halle, H19 from the same variety from Leipzig, G.A. from a mosaic greenhouse plant of the Gustav Adolf variety, and R77 from a new Pomeranian selection cultivated for the first time at Dahlem, Berlin. Other viruses were used in a limited number of tests.

The M23 virus produced on potato leaves a conspicuous interveinal mottling, especially at the tips and edges of the leaflets, but no pathological changes in the habit of growth nor curling of the pinnae. Identical symptoms were produced by a virus (M17) from another source. H19 also caused pronounced mosaic of the interveinal areas, accompanied in this case by marked crinkling or rolling of the leaflets, the tips of which were sometimes curved to the right or left. Similar results followed inoculation with a virus termed M18. Plants inoculated with M29 developed extensive mottling and curling of the leaves, the pinnae of which were abnormally small, with necrotic streaks on the stem and on the apical veins of the under side of the pinnae. The type of mosaic induced by this virus (and by M11, M13, M16, M24, and M25) was characterized by much more extensive curling than that from H19 and M18 Plants infected with the R77 virus in the field showed a striking coarse yellowish mosaic with a slight crinkling of the leaves; in August the symptoms entirely disappeared and the plants appeared quite normal.

Tests of these viruses were made on various hosts. The G.A. virus produced on Samson (Turkish) tobacco plants a 'clearing' of the veins whether it was transmitted by *Myzus persicae* or by rubbing as described by K. M. Smith for his *y* virus [*R.A.M.*, xi, p. 394]. Necrotic spots or rings were not formed and the leaves always remained smooth. *Nicotiana longiflora* plants inoculated with R77 contracted severe mosaic of the yellow-chlorotic type. The inoculation of *N. longiflora* with M23 resulted in the development on the leaves of dark green rings with a pale green central spot surrounded by pale green circles, sometimes followed by concentric necrotic rings in the final stages. H19 produced pale green, concentric rings with only a few isolated yellow spots near the veins. Samson tobacco plants inoculated with M23 from *N. longiflora* developed chlorotic ring spots or irregular mottling, while H19 from the same source produced slight clearing of the veins and small, incomplete ring necroses [cf. ibid., xii, pp. 119, 120]. Further experiments on Samson tobacco with M23, H19, M29, and

R77 indicated that M29 and R77 are related strains, the former presumably resulting from a blend of R77 and another virus (probably M23), and definitely distinct from M23 and H19. Some degree of affinity would also appear to exist between M23, H19, and R77, while G.A. stands apart from any of the others. *Datura stramonium* plants inoculated with M23, H19, and R77 from Samson tobacco developed typical mosaic symptoms, which were most pronounced with M23 and least so with H19. On *Petunia nyctaginiflora* plants H19 caused extensive veinbanding, R77 a condition transitional between a finely speckled mosaic and faint veinbanding, while M23 gave negative results.

The data of these and other experiments [full particulars of which are given] indicate that G.A., transmissible by *M. persicae*, is in all probability identical with the widespread *y* virus; M23 with *x* and ring spot [ibid., x, p. 615 *et passim*]; R77 and H19 new and apparently undescribed, unless they are related to the Kentucky 'etch' viruses [ibid., x, pp. 213, 410]; and M29, a blend of M23 and R77. A close relationship probably exists between M23, R77, and H19, none of which is transmissible by *M. persicae*, while a connexion is further denoted by the similarity of the symptoms caused by these viruses, their identical behaviour in combination with G.A., and their localization in the Halle-Leipzig district (possibly favoured by the sugar beet cultivation there).

Köhler (E.). **Die Rolle der Viruskrankheiten beim Kartoffelabbau.** [The rôle of the virus diseases in Potato degeneration.]—*Angew Bot.*, xv, 2, pp. 122–131, 1933.

Continuing his studies on the virus diseases of plants [*R.A.M.*, xi, p. 796], the writer here summarizes and discusses the information at present available concerning the part played by these disturbances in the complex phenomenon of potato degeneration. Without a doubt leaf roll [see next abstract] is the most injurious and economically important of the potato viruses in Europe, followed by those of the mosaic group, of which at least five must be differentiated, viz., K. M. Smith's *x* and *y*, Murphy's and M'Kay's A [ibid., xi, p. 740], and Köhler's R77 and H19 [see preceding abstract]. The actual part played by the virus diseases in the etiology of degeneration can only be determined by an analytical study of all the environmental and hereditary factors involved in the process.

Schaffnit (E.) & Jöhnssen (A.). **Untersuchungen über Viruskrankheiten. (II. Mitteilung). Beiträge zur Kenntnis der Blattrollkrankheit der Kartoffel.** [Studies on virus diseases. (Note II.) Contributions to the knowledge of the Potato leaf roll disease.]—*Phytopath. Zeitschr.*, v, 6, pp. 603–612, 6 figs., 1933.

The successful results [which are described] of the writers' experiments in the transmission of leaf roll from diseased to healthy potato plants by means of aphids (*Myzus persicae*) and by grafting are considered fully to establish the virus origin of the disease and at the same time to dispose of the physiological

theories of Schander, Schweizer, and Merkenschlager [*R.A.M.*, xi, p. 668].

Koch (K. L.). **The nature of Potato rugose mosaic.**—*Phytopath.*, xxiii, 4, pp. 319–342, 4 figs., 1933.

The results of the writer's experiments [which are fully discussed and tabulated] confirmed previous evidence to the effect that the rugose mosaic of potato is due to the combined action of the mottle virus [*R.A.M.*, v, p. 119; xii, pp. 108, 319], normally present in healthy potatoes, with that of veinbanding [ibid., x, p. 409]. The potato ring spot virus may, however, replace the mottle in the combination with almost identical results.

Both the mottle and ring spot viruses are readily transmissible by plant extract, but not by means of aphids, whereas the veinbanding virus may be conveyed both by plant extract and by the aphids *Myzus persicae* and *Macrosiphum solanifolii* [*M. gei*]. The veinbanding virus therefore may be isolated from the rugose mosaic complex by means of the aphids, whereas the mottle virus may be separated on the basis of differential properties. The ring spot virus has hitherto been found exclusively in association with mottle but can be separated from it by means of the differential rates of progress of the two viruses through the tobacco plant, the first symptoms of the former developing about three days after inoculation, while those of the latter were not apparent before the seventh day.

The thermal death-point of the veinbanding virus was found to be 60° C., the corresponding figures for ring spot and mottle being 68° and 70°. The veinbanding virus resists ageing *in vitro* only about five days, whereas ring spot and mottle may survive this process as long as 28 days. Veinbanding will withstand a dilution of only about 1 to 5,000, the corresponding figures for ring spot and mottle being 1 in 10,000 and 1 in 100,000, respectively. Veinbanding was also found to be more sensitive to chemical treatments than either of the other viruses, being destroyed by nitric acid (1 in 500) in 30 minutes and by 37 per cent. formaldehyde (1 in 100) and 50 per cent. absolute alcohol in one hour.

Tests of the comparative reaction to rugose mosaic of six standard potato varieties indicated that Green Mountain and Bliss Triumph are highly susceptible, while Early Rose, Early Ohio, Irish Cobbler, and Rural New Yorker are relatively resistant, particularly the last-named. Susceptibility to veinbanding was shown by tomato, tobacco (*Nicotiana tabacum*, *N. glutinosa*, and *N. rustica*), *Nicandra physaloides*, *Solanum nigrum*, and *Physalis pubescens*, from which the virus was readily recoverable by artificial inoculation to tobacco. It is possible, therefore, that aphids transmit the veinbanding virus from weed hosts to neighbouring potato plants which, already harbouring the mottle virus, would then develop rugose mosaic. The existence of certain varieties or strains free from mottle and ring spot suggests the use of such stocks as a possible method of combating rugose mosaic.

Comparative studies on material of crinkle A [ibid., xi, p. 594] supplied by Dr. Salaman showed that it contained a virus which

produced a mottling on tobacco similar to that of the mottle virus but that it did not contain the veinbanding virus; furthermore, the author is of opinion that it is unlikely that Salaman's streak is identical with the American rugose mosaic. Evidence was also obtained of the occurrence of the veinbanding and mottle viruses in Dutch potatoes.

SCHLUMBERGER [O.]. **Versuche zur Bekämpfung des Kartoffelschorfes im Jahre 1932.** [Experiments in the control of Potato scab in the year 1932.]—*Mitt. Deutsch. Landw.-Gesellsch.*, xlviii, 10, pp. 195–197, 3 figs., 1933.

Continuing his experiments on the control of potato scab [*Actinomyces scabies*] in Germany by the use of resistant varieties combined with an appropriate fertilizing scheme [*R.A.M.*, xi, p. 321], the writer found that a certain reduction of infection in the highly susceptible Böhm's Allerfrüheste Gelbe and the fairly resistant P.S.G. Maibutter followed 8 applications of superphosphate (4 doppelzentner per hect.), 4 of ammonium superphosphate 9 : 9 (6 doppelzentner per hect.), and 4 of ammonium sulphate. These results, taken in conjunction with Eichinger's protracted experiments [ibid., xi, p. 597] appear to indicate the beneficial action on the potato crop of a well-balanced manuring system, but so far the writer has found no consistent connexion between the various fertilizers and the soil reaction.

None of the six varieties tested for the third time showed marked resistance, but Böhm's Ovalgelbe may be regarded as moderately resistant. Of the varieties tested for the second time, E. Modrow's Aal maintained the high degree of resistance shown the previous year. Promising results were obtained in the first trials with Modrow's Abendstern, Altgold (Raddatz), Edelweiss and Oststärke of the Ostmärk. Saatb. [Eastern Mark seed-testing establishment], and v. Kameke's Robinia; eight others were sufficiently resistant for further testing, while six (including v. Kameke's Centifolia and Pepo) were discarded as too susceptible.

DJELALOFF (R.). Порошистая парша (**Spongospora solani Brunchorst**) Картофеля в Наримановском районе **A.C.C.P.** [Powdery scab (*Spongospora solani* Brunchorst) of Potato in the Nariman district of A.S.S.R.]—Pamphlet issued by *Азербайджанский Сел.-Хоз. Инст.* [*Azerbaijan Agric. Inst.*], Baku, 12 pp., 1933. [In the Azerbaijan language, with Russian translation and English summary.]

The author states that investigations in 1931 disclosed the hitherto unsuspected presence of powdery scab of potatoes (*Spongospora subterranea*) in several mountainous localities of the Nariman district of Azerbaijan. Steps are being taken to prohibit the exportation of potatoes from these localities, since the disease is subject to quarantine measures in Russia, where it is stated to be of very rare occurrence.

NISIKADO (Y.) & MATSUMOTO (H.). **Weitere, vergleichende Untersuchungen über die durch Lisea fujikuroi Sawada und Gibberella moniliformis (Sh.) Wineland verursachten Grami-**

neenkrankheiten. [Further comparative studies on the diseases of Gramineae caused by *Lisea fujikuroi* Sawada and *Gibberella moniliformis* (Sh.) Wineland.]—*Ber. Ōhara Inst. Landw. Forsch.*, v, 4, pp. 481–500, 3 pl., 1933.

A fully tabulated account is given of the writers' further comparative studies on the diseases of Gramineae caused by *Lisea* [*Gibberella*] *fujikuroi* and *G. moniliformis* in Japan [*R.A.M.*, xi, p. 400].

Inoculation experiments under controlled conditions showed that *G. fujikuroi* can induce an abnormal elongation of the seedlings of *Panicum miliaceum*, sorghum, barley, and sugar-cane, in addition to rice and maize, while the germination of *Setaria italiça* seed was prevented by the fungus. The Formosa strain of *G. fujikuroi* showed a particularly high degree of pathogenicity which was only equalled in one test on maize by that from Kyoto. In a previous experiment by the first-named writer in Berlin, the Mexican strain of *Fusarium moniliforme* var. *majus* [ibid., xi, p. 332] proved about equal in pathogenicity to rice and maize with the Kyoto strain of *G. fujikuroi*, a fact leading to the erroneous conclusion that *F. moniliforme* var. *majus* was more nearly related to *G. fujikuroi* than to the type species, *G. moniliformis*. In the present tests the Mexican strain of *F. moniliforme* var. *majus* displayed no very strikingly parasitic behaviour, except in one case with barley from which no reliable inference can be drawn.

[An abstract of an account of these investigations from a different source is given in *Japanese Journ. of Botany*, vi, 3, pp. (79)–(80), 1933.]

Kurosawa (E.). **On certain experimental results concerning the over-elongation phenomenon of Rice plants which owe to the filtrate got from the culture solution of the 'bakanae'-fungi.**—*Rept. Taiwan Nat. Hist. Soc.*, xxii, pp. 198–201, 1932. [Abs. in *Japanese Journ. of Botany*, vi, 3, pp. (72)–(73), 1933.]

The excessive elongation of rice plants [in Formosa] produced by the filtrate of the culture solution of the 'bakanae' fungus (*Lisea* [*Gibberella*] *fujikuroi*) [see preceding abstract] was found to be due to a certain product of the fungus induced only by the presence in the medium of acid potassium phosphate, potassium nitrate, sulphate, or chloride, or calcium nitrate. The phenomenon was not observed when acid potassium phosphate was replaced by calcium or sodium phosphate, whence it is concluded that potassium, not phosphoric acid, is the essential element in the production of the elongating substance.

The 'bakanae' secretion is insoluble in alcohol, ether, toluol, chloroform, xylol, and carbon disulphide, is non-volatile, permeable through collodion membranes, and capable of adsorption by powdered lime-charcoal. It remains unchanged at a temperature of 100° C. for a number of hours either in a dry or moist state, is resistant to cold and direct sunlight, and can retain its properties for one to six years.

MURRAY (R. K. S.). **Diseases of Rubber in Ceylon, 1932.**—*Trop. Agriculturist*, lxxx, 4, pp. 214–217, 1933.

During the period under review evidence was obtained that *Fomes lignosus* may give rise to serious problems in replanting old rubber areas in Ceylon. It appears that in certain instances the fungus remains dormant in the soil and that the staled culture becomes reinvigorated during replanting.

A die-back of 1- to 6-months old green shoots from the bud union was observed on two estates in the Kalutara district and at the Experiment Station, Nivitigalakele. In all the specimens examined a *Diplodia* was present and appeared to have entered at or near the union. Inoculations of green bud shoots with the *Diplodia* gave negative results from which it was concluded that the fungus was only a secondary factor in the disorder. Examination of the union of affected plants showed the invariable presence at the junction of the shoot and stock of an internal pad of coagulated latex presumably caused, as in Java, by an internal fissure [*R.A.M.*, xi, p. 202]. In all cases the shoot bore a very heavy head of foliage, and excessive movement of the shoot in the wind in conjunction with the internal fissure had probably caused a rupture at the union, through which the fungus had entered.

After severe drought in January and February the bark of 2- to 3-year old buddings died back near the union. A study of the condition on an estate in the Ratnapura district showed that the primary cause was sun scorch which had caused the bark on the raised portion of the 'elephant foot' to crack. In most cases *Diplodia* had gained entrance through the cracked bark and had passed up the stem into the wood.

Notes are given on the prevention of decay in the stock snag before callusing is completed by treatment with a waterproof mixture.

Amtliche Pflanzenschutzbestimmungen. [Official plant protection regulations.]—*Beil. Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, p. 6, pp. 220–221, 228–229, 250–255, 259–261, 275–278, 1933.

GERMANY (BRUNSWICK and THURINGIA). Orders dated 25th January, 1933, and 28th December, 1932, respectively, provide for the control of elm disease (*Graphium* [*Ceratostomella*] *ulmi*) in Brunswick and Thuringia on the lines defined in similar regulations already operative in other parts of Germany [*R.A.M.*, xi, p. 272].

POLAND. An order of the Polish Ministry of Agriculture, dated 3rd August, 1932, aims at restricting the spread of potato wart (*Synchytrium endobioticum*) [ibid., viii, p. 664] by the prohibition for use as seed of tubers from infected fields, which must further be boiled or steamed before feeding to stock. Potatoes from infested fields may not be washed in running water, canals, ditches, ponds, or lakes, but the water for this purpose must be emptied into a special pit, at least 0·75 m. in depth, situated at a minimum distance of 5 m. from any well, manure pit, or the above-mentioned waters; after use the pit must be disinfected. The washings from infected material in factories may not be

poured on to the fields. All refuse from diseased potatoes must be buried in a pit at least 0·75 m. in depth. No potatoes or their refuse, root crops, bulbs, weeds, soil, or organic manure may be moved from a farm on which wart disease occurs. Only recognized resistant varieties may be grown on infected land and local authorities may prohibit the cultivation of potatoes altogether on such areas.

Syria and Lebanon (French Mandated Territory). The regulations (6th June, 1931) governing the importation into the French mandated territory of Syria and Lebanon of plants and plant materials are summarized. The products involved are scions for grafting, cuttings, flower bulbs, cut flowers, leaves, fruits, vegetables, root tubers, bulbous tubers, root-stocks, and seeds, and also the materials used for packing them; the restrictions do not apply to such plants or parts thereof as are destined exclusively for culinary, industrial, or medical use, except in special cases. Plant consignments must be accompanied by certificates of freedom from diseases, failing which they will be subjected to examination by the local agricultural officials at the port of entry and dealt with at their discretion.

Bulgaria. An order of the Ministry of Agriculture, dated 25th October, 1932, defines the regulations governing the import into, transit through, and export from Bulgaria of all kinds of living plants (wild and cultivated) and parts thereof. Plant consignments for Bulgaria from foreign countries must be accompanied by certificates of freedom from infectious diseases, with express reference, in the case of material shipped direct from North or South America, Australia, Japan, China, or Hawaii, to *Synchytrium endobioticum* and *Spongospora subterranea* [on potato], *Diplodia zeae* [on maize]. *Bacillus amylovorus* [on apples, pears, and other fruits and ornamentals], *Endothia parasitica* [on chestnut], and *Plowrightia morbosa* [*Dibotryon morbosum* on cherries and plums]. For transit through the country the consignments must be packed in such a way as to obviate any possibility of the dissemination of infection. Directions are given for procuring the necessary certificates to accompany plant consignments from Bulgaria to foreign countries.

Amtliche Planzenschutzbestimmungen. [Official plant protection regulations.]—*Nachrichtenbl. Deutsch. Pflanzenschutzdienst*, iv, 5, pp. 117–183, 1933.

A summary is given of the existing plant protection regulations in Egypt, embodying the orders of 1st and 20th January, 1916, 22nd June, 24th November, and 15th December, 1919, 27th May, 1920, 1st March, 1922, 18th June, 1931, and 30th August, 1932.